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THE UNIVERSITY OF ALBERTA

A STUDY TO ESTABLISH NORMS, FOR EDMONTON PUBLIC SECONDARY SCHOOL BOYS, OF THE YOUTH FITNESS TESTS OF THE AMERICAN ASSOCIATION FOR HEALTH, PHYSICAL EDUCATION, AND RECREATION

A Thesis Submitted to the Faculty of Graduate Studies

in Partial Fulfilment of the Requirements for

the Degree of Master of Education

Division of Secondary Education

Faculty of Education

by

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Edmonton, Alberta

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ABSTRACT OF THESIS

The problem selected for study was the establishment, for the first time, of norms for the physical performance of boys in the Edmonton Public Junior and Senior High Schools as a whole system. The specific topic chosen was motor fitness, an approach to the study of physical fitness which avoids as far as possible the elements of hand-eye and foot-eye coordination, but includes all other elements usually accepted by authorities.

The testing instrument chosen was the Youth Fitness test battery of the American Association for Health, Physical Education, and Recreation (AAHPER). The seven test items included pull-ups to exhaustion, sit-ups to exhaustion or to an arbitrary limit of one hundred repetitions, a shuttle run of four ten-yard laps, the standing broad jump, the fifty-yard dash, the softball throw for distance, and the six-hundred-yard run (or run and walk).

The tests were administered to 5,692 boys by fifty-nine teachers who had first received instruction. They were conducted during October, 1959. The teachers recorded performance data and performed classification computations using age, height, and weight.

Each teacher was individually interviewed to assess the validity of his data. Certain data were discarded, because of misunderstandings of instructions. All computations were re-worked.

All data were punched on IBM cards, and were sorted to produce frequency distributions by age and age-height-weight classifications.

Norms were drawn up as combined percentile scoring tables and profile charts, for use by teachers and individual boys.

Distributions of data for several test items appeared to be skewed, thus it was concluded that the percentile form of norms was a good choice.

Previous investigators had found the test items to be reliable, but some distributions in the present study suggested the influence of psychological factors upon performances requiring muscular or cardiovascular endurance.

The elements of motor fitness appear to overlap considerably in the test items.

It was concluded that there does not yet exist a precise enough definition of physical fitness to determine accurately the standards of physical fitness necessary for persons in different walks of life.

The AAHPER tests had been conducted also in the United States, Great Britain, and Denmark. Although samples differed widely in composition, nevertheless North American boys appeared to be inferior to European boys in motor fitness as measured by these tests, except in the softball throw.

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Finally, the writer wishes to express particular thanks to his wife, Saralie Routledge, and to Mrs. M. E. Mager for their help in completing the work, and to his family for their patience and cooperation during his months of preoccupation.

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DEFINITIONS

AAHPER : American Association for Health, Physical Education, and Recreation, a department of the National Education Association, 1201 Sixteenth Street, N. W., Washington 6, D. C., U. S. A.

CAHPER : Canadian Association for Health, Physical Education, and Recreation, Incorporated, 95 Wellesley Street, East, Toronto, Ontario, Canada.

CHAPTER I

INTRODUCING THE PROBLEM

For many years the physical education program of the Edmonton Public Schools has been conducted without definite goals of physical performance for boys and girls. An increasing number of administrators, teachers, and parents are of the opinion that physical education should have some measured goals, comparable to those of other school subjects. Many of these people are also anxious to know how the children of Edmonton compare with those of other parts of the world in their physical capabilities.

I. THE ROLE OF MEASUREMENT IN PHYSICAL EDUCATION

In physical education, as in general education, the term "evaluation" may be defined as the appraisal of the attainment of educational goals. The first step in the process must therefore be the definition and acceptance of worthwhile objectives. The second step involves the collection of data, both qualitative and quantitative, while the third step is the judgment of the significance of the data in the light of the accepted objectives.

The term "measurement" applies to the second step in evaluation, and is applied to data which are relatively precise, objective, quantitative, and capable of statistical treatment. Measurement utilizes, among other things, standardized tests and achievement scales.

Evaluation, including measurement, has as its primary purpose the improvement of teaching. This improvement may be achieved through the

following avenues:

1. Marking and promotion of pupils.
2. Diagnosis of individual strengths and weaknesses, with possible guidance toward strengthening of deficiencies.
3. Classification of pupils for instructional grouping.
4. Motivation of pupils' efforts, both in direction and intensity.
5. The value of some test activities as teaching procedures in themselves.
6. Appraisal of instructors, methods, and materials.
7. Research, resulting in the improvement of existing evaluative tools and the creation of new ones.

The foregoing views were expressed in 1949 by Bovard, Cozens, and Hagman (1:3-13). In the opinion of the present writer their analysis is sound and comprehensive.

In order to identify areas in which research is needed, it will be necessary to consider the generally accepted objectives of physical education.

II. THE OBJECTIVES OF PHYSICAL EDUCATION

Perry, after surveying thirty-five courses of study from various American states and Canadian provinces, was able to make the following single statement of aim for physical education:

> Physical education seeks, through a program of worthwhile physical activities and related experiences, the same general goal that gives purpose to all the learning activities of the school. The aim of physical education is the physical, mental, and social development of the students, so that they can make the maximum contribution as individuals and as responsible citizens to our democratic society. (33:17)

In examining the more specific objectives of physical education listed by his thirty-five sources, Perry found that they could be grouped conveniently under the three main headings suggested by his statement of aim:

Objectives of Physical Development

1. To develop physical health and organic vigor, good posture habits, and the correction of remediable posture defects.
2. To develop muscular strength and coordination used in games, rhythmical activities, other worthwhile physical recreational skills, and the fundamental motor skills which are important for safety and efficient body management in daily life.
3. To develop physical stamina which permits the individual to work or play for longer periods with a reserve of strength.
4. To develop the ability to relax while under the emotional strain of physical competition.

Objectives of Mental Development

1. To develop health knowledge, health attitudes, and health habits.
2. To develop understanding, making for sane treatment of body strength and endurance.
3. To develop the powers of observation, analysis, judgment, and decision through the medium of complex activities.
4. To develop opportunities for creative self-expression in forms of physical activity.
5. To develop an understanding of body structure and functioning in terms of principles of mechanics and dynamics.
6. To develop an interest in the folk lore and music of many countries.

Objectives of Social Development

1. To develop desirable personality traits such as: leadership, cooperation, sportsmanship, courage, persistence, tolerance, self-confidence, initiative, self-discipline, a proper attitude toward victory and defeat, dependability, honesty, loyalty, respect for rules and laws, respect for others, and emotional control.
2. To provide opportunities for personal success and achievement through participation in group activities.
3. To develop abilities, attitudes, and understandings which provide for individual and group safety.
4. To develop wholesome attitudes towards life and life's problems by participation in worthwhile physical activities in a good environment and under capable leadership.

5. To foster the social integration of each individual within the group through activities that give opportunities for satisfying experiences.
6. To develop a sense of individual and group responsibility for civic behaviour on the playground, in the school, and in the community.
7. To help individuals to adjust themselves to the demands of a democratic society.
8. To provide experiences that give release from the emotional strains and nervous tensions that build up in a complicated form of society.
9. To develop an interest in various forms of physical activity, including some co-educational activities, which will cause the individual to engage in such activities both during and after school life; participation type of interest. (33:15-17)

Van Vliet (43:3), in editing and publishing the authorized physical education text for Alberta junior and senior high schools in 1956, accepted and quoted Perry's carefully worded statement of objectives.

Examination of these objectives reveals at once that many of them might be achieved, at least in part, by school subject areas other than physical education. Certainly many of the objectives of mental development, and several of the objectives of social development, might well respond to academic instruction and cooperative non-physical activities carried on in the classroom. The writer does not contend, of course, that these objectives can be fully achieved without physical activity. He is attempting to isolate those objectives to which physical education alone can contribute.

III. THE OBJECTIVES OF PHYSICAL DEVELOPMENT

The objectives of physical development may be analyzed in various ways. Perry, as we have seen, includes from his thirty-five sources the elements of physical health and organic vigor, good posture habits, muscular strength, coordinations and skills applicable to work, play, and

safety, stamina, and the ability to relax. There is wide agreement regarding these elements.

There is much less agreement regarding the means to be used to achieve these objectives. European programs of physical education have tended to emphasize formal, artificially contrived body movements and the use of gymnastic apparatus requiring considerable muscular exertion. North American programs, after initial imitations of the European pattern in many areas, including Alberta, have lately tended to emphasize individual and team competitive games and sports. In Alberta this latter trend began approximately at the end of World War II.

It was inevitable that physical educators and others interested in the physical welfare of young people should begin to compare the results of the two opposing types of physical education programs. The comparison has attracted the attention of medical men, physical educators, and legislators, and has centred on the topic of physical fitness.

IV. A DEFINITION AND ANALYSIS OF PHYSICAL FITNESS

Clarke (6:16) uses the terms "physical fitness" and "physical vitality" as alternative expressions of the same positive quality, which he sees as extending on a scale from death to abundant life, existing to some extent in all living individuals in varying amounts at different times. He sees the quality of physical fitness as being much more than not being sick, merely being well, resisting disease, or being immune to disease. According to Clarke:

> The person with adequate physical fitness should be able to carry out his daily tasks without undue fatigue and should still have an ample reserve of energy to enjoy leisure time and to meet unforseen emergencies. (6:16)

Orban and Plewes (32:2-4), in designing the Canadian Physical Efficiency Tests in 1957, considered physical fitness to be one of four components of total fitness, along with emotional stability, mental security, and social adequacy. They stated that the level of physical fitness which can be developed by an individual depends upon the type of body he inherits, his health status, and the extent to which his physical efficiency potential has been developed. Physical efficiency, in turn, was analyzed as having a "basic" aspect and a "special" aspect, both measurable. Basic physical efficiency was considered to be the balanced development of muscular and organic power, related to the physique of the individual. Special physical efficiency relates to specific work and sports skills, and depends only partly upon basic physical efficiency, in their opinion.

An important feature of this analysis by Orban and Plewes is the claim for a basic aspect to physical efficiency or fitness. Hitherto many authorities had considered physical fitness to be entirely specific to work or sport activities. Morgan and Adamson of Great Britain firmly support the view expressed above, in the following statement:

> In the nature of things it is impossible to define or describe this state of general fitness as precisely as the fitness required for one particular activity. It can never be completely put to the test of competitive performance. But if it is to be a legitimate objective of training there must be some agreement as to its nature and the manner in which it can be assessed. Such agreement will call for a careful consideration of the many and varied factors which contribute to general motor efficiency. No one will question the importance of hygienic and psychological qualities, and of factors such as speed, flexibility, general agility and specific skills. But the contention here put forward is that the hard core of fitness is the efficiency of the muscular and circulo-respiratory systems. These may be regarded as the engine which determines the work output of the body and their efficiency may be expressed in terms of strength, muscular endurance, circulo-respiratory endurance and power. (28:13-14)

Clarke (6:221) analyzes the term "fitness" into three aspects. The most general of these he calls general motor ability. Motor fitness is considered to be a limited phase of general motor ability, and physical fitness a still more limited aspect. The relationship is shown diagrammatically in Figure 1.

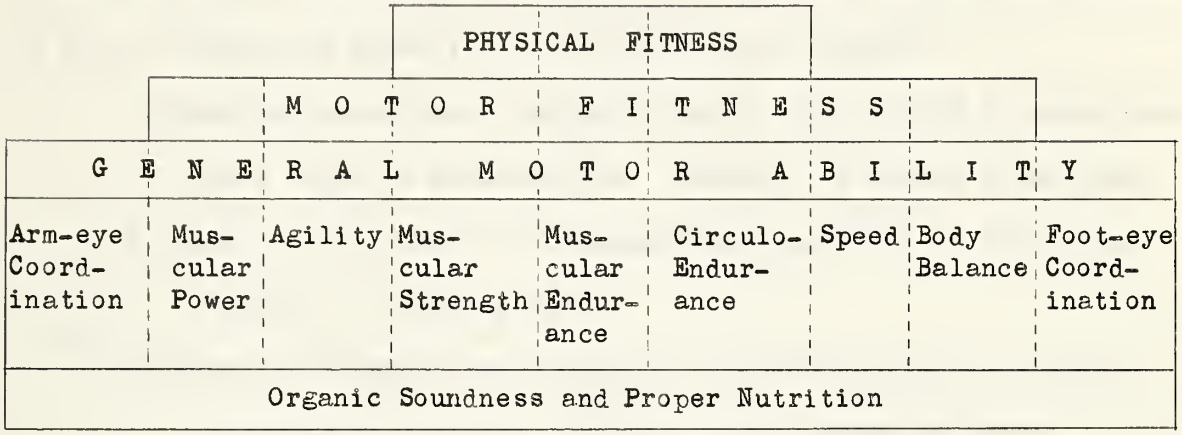


Figure 1. The elements of physical fitness, motor fitness, and general motor ability.

It will be observed that Clarke's concept of motor fitness as charted in Figure 1 includes the elements of basic physical efficiency as defined by Orban and Plewes (32:2-4) and the elements of the hard core of fitness as defined by Morgan and Adamson (28:13-14). There appears to be a general realization on the part of many authorities that cardio-respiratory efficiency determines in great measure the continued activity, or endurance, of the entire organism. Muscles are enlarged and strengthened and their endurance is increased through vigorous exercise, but their endurance increases out of proportion to their size or strength. It would appear that cardio-respiratory action results in more rapid and complete supply of oxygen and nutrition to the muscle cells, and in more

rapid and complete removal of waste products, hence the disproportionate increase in endurance.

The present writer has accepted Clarke's definition and analysis of motor fitness as being a suitably concise and logical framework in which to conduct the present study. To complete his definition so that it may be fully understood by the reader, his definitions of the elements of motor fitness are given in the following list (6:222):

1. Muscular power means explosive power, the ability to apply maximum force in minimum time. Example: standing broad jump.
2. Agility means speed in changing body positions or direction. Example: a dodging run.
3. Muscular strength means maximum strength applied in a single muscular contraction. Example: grip strength measured by a manuometer.
4. Muscular endurance means the ability to continue muscular contractions at an intensity below maximum. Example: pull-ups.
5. Circulatory endurance means the ability of the circulo-respiratory systems to adjust to moderate contractions of large muscle groups over a long period of time. Example: distance running.
6. Speed applies to the rapidity with which successive identical movements can be performed. Example: sprinting.
7. Body balance refers to ease in maintaining body position. Example: hand stand.

V. REASONS FOR CONCERN ABOUT PHYSICAL FITNESS

Fitness for Military Service in English-speaking North America

In the United States, Hunsicker (18:1) points out, interest in the field of fitness has been intense during war years and has fallen away during peace-time. Williams (45:26-27) states that the American armed services in 1917 found it necessary to reject approximately 40 per cent of all drafted males between twenty-one and thirty-one years of age. Draftees came from all walks of life. In 1940 males from twenty-one to thirty-six years of age were drafted, but college students, medical and engineering students, married men with dependents, and men in essential industries were exempted, therefore the less fit part of the United States population was selected. Of the actual draftees, 45 per cent were rejected for physical and mental defects. It was found that 200,000 of the 900,000 rejects in 1940 could be completely rehabilitated by dental and medical service. The remaining 700,000 or 35 per cent, were rejected for defects the great majority of which were preventable, the result of environment, not heredity.

The Department of National Health and Welfare at Ottawa reported (34:1) that in October, 1956, a normal month in the American selective service situation, 34.6 per cent of the 30,000 youths eighteen to twenty years of age could not qualify for service.

By contrast, in the same year, only 9.3 per cent of British youths of the same age failed to qualify, while in West Germany only 20 per cent were rejected.

The Canadian record, unfortunately, follows the American pattern.

Of course there is reason to question the meanings of such figures. Are the reasons for rejection the same in one country as another? For example, Howell (16) points out that in the American situation psychiatric disorders are classed as medical disqualifications. He estimates the rejections due to physical reasons within the scope of physical education as being nearer to 20 per cent. It is not the purpose of this study to resolve the truth of the question. The claims and counterclaims are both evidence of concern.

Official and public concern over physical fitness has waned after the end of each world war. There is, however, an unusual interest in the topic during this (technical) era of peace. One of the reasons has been the impact of the Kraus-Weber tests.

The Kraus-Weber Tests of Minimum Muscular Fitness (20,21)

The Kraus-Weber tests of minimum physical fitness comprise five strength items and one flexibility item, which are described in detail in Chapter II of this study. Each movement is performed once, on a pass-or-fail basis.

The tests were originally designed by Kraus to determine whether polio patients were rehabilitated sufficiently to leave hospital. They were later applied in a posture clinic, and still later were applied to measure progress in treating people afflicted with lower back pain. Of the total of 5,000 patients seeking relief from the pain, 4,000 were regarded as absolutely normal by regular medical examinations, yet all of the 4,000 failed one or more of the six tests when administered by Kraus (22).

The tests were next applied to 4,458 eastern United States school

children between the ages of six and nineteen, and to 3,156 Swiss, Austrian, and Italian children, by Kraus, Hirschland (Prudden), and associates (21). The startling results of these tests were reported in the AAHPER Research Quarterly of May, 1954:

1. Fifty-seven per cent of the United States children tested failed one or more of the six tests; 8.7 per cent of the European sample failed.
2. Of the United States children tested, 44.3 per cent failed the sixth, or flexibility exercise; 7.8 per cent of the European children failed.
3. Of the United States children tested, 35.7 per cent failed one or more of the first five (strength) tests; 1.1 per cent of the European children failed.

The results of these tests were brought to the attention of President Eisenhower. Dr. Kraus was asked to report to him at at a White House luncheon in 1955. The President's reaction was such that the magazine "Sports Illustrated" was able to publish an article entitled "The Report that Shocked the President!" (2). Largely because of the Kraus-Hirschland surveys, President Eisenhower called a conference on Fitness of American Youth on July 2nd, 1956. As a result of this conference, Mr. Eisenhower created a Council for Youth Fitness, composed of members of his Cabinet and an Advisory Council of physical education and medical authorities. The American Association for Health, Physical Education, and Recreation (AAHPER) held a conference on Youth Fitness in Washington on September 13th, 1956, and arranged for a meeting of selected members of the AAHPER Research Council in February, 1957. After two days of conference, this

select group had outlined the design for a national survey of American youth, subsequently called the AAHPER Youth Fitness Project. This project is described in Chapter II of the present study.

The foregoing description of events is intended merely to illustrate one of the causes for the continuing interest in physical fitness on our continent. Further discussion of the merits or shortcomings of the Kraus-Weber tests is contained in Chapter II of this study.

The Canadian Physical Efficiency Tests (32)

The Canadian Physical Efficiency Tests were designed by Dr. William A. R. Orban, Director of the R.C.A.F. Recreation and Physical Fitness Branch, and Dr. Doris Plewes, Consultant in Fitness and Recreation Services, Department of National Health and Welfare, Ottawa, in 1957.

The test battery consists of eight items, intended to evaluate organic efficiency, flexibility, muscular strength, power, and endurance, speed, and circulo-respiratory endurance. Standard achievement scales for each event permit scoring of the performances of each individual according to his type of physique. The test items are described in greater detail in Chapter II of the present study.

The tests were administered in Edmonton by Dr. Plewes during November, 1957, to 556 boys and girls ranging from grade two to grade eleven. According to the results of the tests the Edmonton children fell short of the criterion standards on five of the eight test items. The most serious deficiencies, in order of importance, were explosive power of the arm and shoulder muscles, power and coordination of the leg muscles, and endurance of the arm muscles.

Further discussion of the Canadian Physical Efficiency Tests,

indicating possible merits and shortcomings, is contained in Chapter II of the present study. The results of the tests in Edmonton merely add further evidence, local in this case, of cause for concern about the physical fitness of our young people.

Other Causes for Concern

Other causes for concern about fitness of various kinds could be discussed. Here are a few: reported increases in cardiac ailments of the middle-aged, reported increases in mental ailments at all age levels, the problem of automation in industry with consequent increase in leisure time, the trend to spectator amusements as contrasted with active participation, the virtual elimination of the legs as a factor in transportation of many human beings, and so forth.

VI. THE IMPORTANCE OF THE FITNESS OBJECTIVE IN PHYSICAL EDUCATION

Many eminent authorities favor the placement of physical fitness, with the attendant use of scientific measuring devices, at the core of physical education. In this list must be placed Kraus, Orban, and Plewes (all quoted previously in this chapter) and the many authorities quoted in Chapter II of this thesis, wherein other studies related to the topic are examined. There is no doubt that full implementation of the point of view of these authorities would be a far swing of the pendulum from the fully "games-centred" programs which have developed in various places on our continent.

There are many other authorities advocating a middle-of-the-road policy. Rae Speirs, Director of Physical Education for Toronto Public Schools, warned the 1959 Biennial National Convention of the Canadian

Association for Health, Physical Education, and Recreation (CAHPER) in these words:

> Is it not possible that the exercise we need for a push-button age is exercise for the involuntary muscles in the heart, blood-vessels, lungs and digestive system - and not compensatory exercises for little-used skeletal muscles? This would mean that we were right all along in concentrating on vigorous games and activities with a lot of running and dodging, rather than switching to stationary calisthenics, gymnastics and weight lifting, which furnish limited stimulation to the circulation, respiration and perspiration. It's worth thinking about. As I said before - on this subject I have an open mind. (37)

Jay B. Nash made the following statement in December of 1959:

> Every activity of the school and community — physical education is one, along with English, science, social studies and so forth — is concerned with all phases of education and life outcomes, but each must have a focus and each must have fringe area objectives. The focus in Physical Education is FITNESS - body ability to sustain adaptive effort. (29)

Max Howell expressed his considered opinion in the following quotation from an editorial in the Journal of CAHPER:

> If one agrees with Nash, that the focus of Physical Education is fitness, then we should introduce fitness-type activities into the programme if they be not there already. This surely is the fundamental concern of our profession.
>
> However, and this point must be clearly appreciated, this does not mean a sudden departure from the teaching of sports and recreational skills. It merely means a change in emphasis perhaps, with the introduction in sensible amounts of such activities as circuit training, weight training and the"5BX" programme. Recent research indicates very clearly that surprising results may be obtained by relatively little time devoted to fitness training, provided this training is both regular and progressive.
>
> The fitness emphasis in physical education is with us and will remain. Our chief concern should be in discovering the ways this objective may best be realized, always remembering that the proper perspective must at all times be maintained. Let FITNESS be our FOCUS. But let us view with alarm infringements on our other accepted objectives such as the development of sports and recreational skills and social and emotional development. (15)

The foregoing statement by Howell also expresses the view of the

present writer.

VII. GENERAL PURPOSES OF THE PRESENT STUDY

Physical fitness has been accepted as a worth-while objective of physical education. Programs and pupil performance should therefore be evaluated in terms of achievement of or failure to achieve this objective.

It is the purpose of the present study to provide for a means of measuring motor fitness of boys in the public junior and senior high schools of Edmonton. At the moment, Edmonton teachers who wish to evaluate the achievement of the physical fitness objective in their classes are faced with a bewildering variety of choices of test. Clarke (6) lists forty-six tests or test batteries intended to measure physiological (cardiovascular) fitness, strength, motor fitness, and general motor ability. The Canadian Physical Efficiency Tests (32) and the Physical Fitness Tests of the State of Iowa (40) bring the total to forty-eight. Many of these tests require considerable equipment, teacher training, and time to administer. Norms or standards for these tests do not exist for boys of the city of Edmonton or the Province of Alberta. All such data have been compiled abroad, mostly in the United States. In order that this type of measurement may take place in Edmonton, such norms must be established, either for an existing test, or for a test to be devised as suitable for Edmonton boys and the Alberta climate.

In order to decide upon a suitable test or test battery, the next chapter will review a number of the existing tests.

CHAPTER II

RELATED STUDIES: A SURVEY OF THE LITERATURE

It was decided in Chapter I of the present study to consider only those elements of physical fitness which contribute to motor fitness as defined by Clarke in the chart reproduced on page 7 (6:221). An exhaustive catalogue of tests and batteries of tests devised to evaluate all of the elements of general motor ability would be virtually impossible, because of the complexities introduced by the elements of arm-eye and foot-eye coordination. To a great extent, therefore, the tests described here have been drawn from Clarke's selection of those which have proved to be of more than passing interest and usefulness in the area of his definition of motor fitness. Two notable exceptions to this basis of selection are the Iowa Physical Fitness Tests and the Canadian Physical Efficiency Tests.

I. TESTS OF PHYSICAL (CARDIOVASCULAR) FITNESS

Crampton Test of Blood-Ptosis (6:97)

The Crampton Test of Blood-Ptosis was reported in the "Medical News" of September, 1905, by C. Ward Crampton. The differences between reclining and standing pulse-rates and systolic pressures, respectively, are read as coordinates of a scoring table. The test appears to discern differences in condition of sick and convalescent persons, but does not do so adequately for normal and athletic individuals.

Barach Energy Index (6:98)

The Barach Energy Index was reported in the Journal of the American

Medical Association in February, 1914, by H. H. Barach. All data is obtained with the subject sitting. The following formula is applied:

$$\text{Energy Index} = \frac{\text{pulse rate (systolic pressure + diastolic pressure)}}{100}$$

The index is taken to be a measure of energy expended by the heart.

Schneider Test (6:99)

The Schneider Test was developed by E. C. Schneider during World War I, and was reported in the Journal of the American Medical Association in May, 1920.

Readings are obtained which are read into six separate tables: reclining pulse rate, increase in pulse rate on standing, standing pulse rate, pulse rate increase immediately after exercise (a fifteen-second step test on an $18\frac{1}{2}$-inch bench), return of pulse rate to standing normal following exercise, and difference between reclining and standing systolic pressure. The score on the test is the sum of the six scores listed.

Correlations between Schneider test scores and various criteria of endurance, such as distance running, vary from .81 to .44, hence its predictive value is uncertain. Further, the test is too difficult to administer for use by regular classroom teachers.

McCurdy-Larson Test of Organic Efficiency (27:274)

For the McCurdy-Larson Test of Organic Efficiency twenty-six items were tested, and five of these were chosen by the bi-serial correlation method. T-scores were constructed for each, and a single index was produced by combining the weighted scores of the five. The test elements are sitting diastolic blood pressure, breath-holding for twenty seconds

after a stair-climbing exercise, difference between standing normal pulse rate and pulse rate two minutes after exercise, sitting pulse pressure, and standing pulse pressure. Larson later produced a shorter form of the test using the first, second, and fifth of the elements noted.

The test was validated by comparison with times achieved by varsity and Olympic swimmers in a 440-yard swim, and by comparison with recently released infirmary respiratory patients. Correlations were of the order of .70, not high enough for consistent accuracy of prediction.

Tuttle Pulse-Ratio Test (40)

In the Tuttle Pulse-Ratio Test the subject first sits quietly until the sitting pulse-rate becomes constant, when a one-minute reading is recorded. He next steps up and down on a thirteen-inch bench for one minute. The rate is twenty step cycles per minute for boys and fifteen for girls. A step cycle uses four counts: place the left foot on the bench, then the right foot on the bench beside the left in standing position, then the left foot on the floor, and finally the right foot on the floor beside the left in standing position. A metronome may be used; in any case the exact number of steps actually taken is recorded. The subject sits at once and the pulse is taken for two minutes, the count starting while he is still on his feet. He then repeats the stepping exercise, but at a faster rate, forty step cycles for boys and thirty-five for girls, supposedly, but in any case the actual amount accomplished is recorded. Again a two-minute pulse count is taken.

The scoring requires calculation of the number of steps needed to give a pulse-ratio of 2.5, by a formula:

$$S_0 = S_1 + \frac{(S_2-S_1)(2.5-R_1)}{R_2-R_1}, \text{ where}$$

S_0 = number of steps to be found which will give the 2.5 pulse-ratio.

S_1 = number of steps in first minute (should be twenty for boys, but actual number is recorded).

S_2 = number of steps in second minute (should be forty for boys, but actual number is recorded).

R_1 = first pulse ratio, i.e. first two-minute post-exercise count divided by sitting one-minute normal count.

R_2 = second pulse ratio, i.e. second post-exercise count divided by normal count.

Results of the test agree well with doctors' estimates of heart condition, but poorly with performance of endurance events in athletics.

Harvard Step Test (6:105)

The Harvard Step Test test was devised by Lucien Brouha (3) in 1943.

The subject steps up and down on a twenty-inch bench thirty times a minute for five minutes, using the same four-count step rhythm as used in the Tuttle Pulse-Ratio Test described on page 18 of the present study. He may change the lead foot as he desires.

The subject immediately sits, and pulse counts are taken from 1 to $1\frac{1}{2}$ minutes, 2 to $2\frac{1}{2}$ minutes, and 3 to $3\frac{1}{2}$ minutes after stepping ceases.

A Physical Efficiency Index is calculated:

$$PEI = \frac{\text{Duration of exercise in seconds}^{\text{*}} \times 100}{2 \times \text{Sum of pulse counts}}$$

(* should be 300, but the subject may be unable to finish.)

A number of authorities have attempted to validate results of the Harvard Step Test by comparing it with many other strength and endurance measures. Correlations have varied between .002 and .031, indicating a poor degree of usefulness.

Straight Runs

Distances up to one mile have been used to rate cardiovascular fitness, especially by the military forces during and since World War II. Unfortunately, shorter runs depend largely upon speed, while knowledge of pace determines success in the longer runs. Such tests are relatively easy to administer, however.

Endurance Ratio

The Endurance Ratio is the relation between times taken by the same individual in short and long runs. McCloy (26) discovered that the ratio of the six-second run compared with the 300-yard run had a high factor weighting with circulo-respiratory endurance (.88).

Drop-off Index (6:118)

In calculating the Drop-off Index the slowing up in various parts of long runs is recorded. Another method considers the difference between theoretical time for a long distance at the subject's sprint speed and his actual time for that distance. The Canadian Physical Efficiency Tests (32) require the subject to sprint initially in the longer run, and to maintain as high a speed as possible throughout, as opposed to pacing at any stage.

Residual Index (6:118)

Because drop-off indices tended to correlate highly with time for

the shorter distance chosen, Henry and Kleeburger (14) compared the time for a seventy-yard sprint, less the time for the first ten yards, with the time for a 220-yard run. The result was the Residual Index.

Summary of Findings

Attempts to correlate the results of such cardiovascular tests as Crampton's Blood-Ptosis Test, Schneider's Test, McCurdy-Larson's Test of Organic Efficiency, and the Harvard Step-test have yielded correlations of the order of .29 and lower, usually. These tests apparently do not measure the same things.

Correlations between cardiovascular tests and endurance swimming or running yield figures no higher than .70.

Correlations between cardiovascular tests and strength tests vary from very high (.94) to very low (.20).

Of the running tests of endurance Clarke (6:118) and McCloy (26) both conclude that the Endurance Ratio offers most promise to physical education teachers. The validity of tests involving longer runs is still questioned by many authorities, who believe that subjects should be but usually cannot be motivated to approach exhaustion in such runs.

II. TESTS OF BACK AND HIP FLEXIBILITY

Measures of back and hip flexibility usually use some form of touching the toes, with the knees straight. The tests are taken in either the standing, floor-touching manner, or the sitting, forward-reaching manner. Some forms of the tests do not permit bobbing of the trunk, while others require the bobbing. Scoring is done on a scale of inches and halves, usually placing zero at the floor level, or even with

the soles of the feet.

The significance of trunk-hip flexibility in motor performance has not been proved. All correlations of flexibility measures with motor ability tests, or with specific athletic events, have been low.

III. STRENGTH TESTS

All human cultures have practised feats of strength and feats of endurance.

The Rogers Physical Fitness Index Tests (PFI) (6:183)

Dr. Frederick Rand Rogers first published his tests at Columbia University in 1926. Age in years and months, height to the nearest half-inch, and weight to the nearest pound, are recorded. The seven test items are briefly described:

Lung capacity. Lung capacity is measured in cubic inches, the subject blowing into an instrument called a wet spirometer. Measure is taken from complete inhalation to complete exhalation.

Grip strength. Grip strength is measured to the nearest pound by an instrument called a manuometer or hand dynamometer. The right hand is tested first, then the left.

Back lift. The subject stands erect with the knees straight, then bends forward only slightly to grasp a horizontal bar about two feet long, attached by a chain to a machine called a back and leg dynamometer. The subject lifts strongly and steadily. If preliminary positionings are correct, the back should be almost erect at completion of the lift. Hand

position requires that one palm should face away from and the other toward the subject's body. The feet must be flat on the platform. The lift is recorded in pounds.

Leg lift. The subject stands erect with the knees slightly bent, but with the feet flat. The grip bar is held with both hands at the centre, palms down, and with the ends of the bar resting at the junction of the thighs and trunk. A belt is attached to the bar and passed around the hips. The lift is made with the legs, and is read in pounds. The adjustment of chain length, which provides for just the right starting angle for the knees, is of utmost importance. Lift readings may reach 2,500 pounds !

Pull-up test for boys. A chinning bar, preferably with grip rings attached, to allow the wrists to twist naturally, is placed high enough that the feet of the subject cannot touch the floor. If no rings are available, an horizontal bar is grasped with the palms away from the face. The chinning motion requires the elbows to be fully extended before each chin, and the chin to come level with the top of the bar. Half-chins, to a maximum of four such, are recorded if the subject fails to go all the way up or down, or kicks, jerks, or kips his legs. Further half-chins disqualify the performer.

The girls' form of the test is omitted here.

Push-up test for boys. The push-up test is usually conducted on parallel bars, set at shoulder height. The subject jumps to cross rest position at the end of the bars, facing inward, with the arms extended. He then bends his arms until the angle at his elbows is less than a right

angle, and pushes back up to the straight-arm position. The jump-up is allowed as first count, and each re-arrival at the straight-arm position counts one more. Half-counts, to a maximum of four such, are recorded for kicking, jerking, or failing to bend or straighten the arms sufficiently.

The girls' form of the test is omitted here.

Scoring of the Rogers strength tests.

1. Arm strength = (pull-ups + push-ups) $\left[\frac{\text{Weight}}{10} + \text{height}^{*} - 60\right]$

   (* If height is less than 60 inches, eliminate it and the figure 60 from the formula.)

2. The Strength Index (SI) is the total of the raw scores from the tests of lung capacity, right grip, left grip, back strength, and leg strength, plus arm-strength as obtained from the formula above.

   Norm charts based on sex, weight, and age were prepared by Rogers.

3. The Physical Fitness Index (PFI) is completed thus:

$$\text{PFI} = \frac{\text{Achieved SI}}{\text{Normal SI}} \times 100$$

Administrative remarks. Careful administration of the Rogers strength test battery is required.

Pre-teaching and practice of the test items is advised.

Warm-up is also recommended.

Assessment of the PFI. The PFI gives a rating of muscular strength

and muscular endurance, not circulo-respiratory endurance.

An unusual PFI score may provide more than a measure of physical condition. Persons with very low, very high, or rapidly changing PFI's should be studied by the physical educator, and if necessary should be referred to a physician. For example, nervous disorders and tubercular tendencies have been indicated by very high scores.

Reliability and objectivity ratings of the PFI tests are high, ranging from .86 to .97.

Validity was evaluated against physicians' estimates of health status in university students. The correlation of .65 compares reasonably with the .48 correlation which was discovered between I.Q.'s as measured by the Stanford Revision of the Binet-Simon Intelligence scale and teachers' judgment of intelligence (35:43).

Oregon Simplifications of the PFI (6:209)

Clarke and Carter (7) simplified the original test battery for boys at various school levels. Some of these variations are:

1. Upper elementary school:

$$SI = 1.05(\text{leg lift}) + 1.35(\text{back lift}) - 10.92(\text{push-ups}) + 133$$

2. Junior high school:

$$SI = 1.33(\text{leg lift}) + 1.20(\text{arm strength}) + 286$$

3. Senior high school:

$$SI = 1.22(\text{leg lift}) + 1.23(\text{arm strength}) + 499$$

McCloy's Revisions of the PFI

McCloy and Young (25:129) claimed that breathing capacity should not be included as a strength test, and that the Rogers formula for arm

strength penalizes small persons and over-scores persons of unusual chinning and dipping ability. The boys' formulas proposed to replace those of Rogers are:

1. Chinning or dipping strength =

   1.77(weight) + 3.42(chins or dips) − 46

2. Chinning and dipping strength =

   3.54(weight + 3.42(chins + dips) − 92

3. The resultant Athletic Strength Index is:

   Right grip + left grip + .1(back lift) + .1(leg lift)

   + 2(chinning strength) + dipping strength − 3(weight)

The Kraus-Weber Tests of Minimum Muscular Fitness (20,21)

The Kraus-Weber tests of minimum muscular fitness were discussed briefly in Chapter I. They comprise six items as reviewed by Clarke (6:214-219).

Abdominals plus psoas. The subject starts in supine position with the legs held straight, with the feet held down by an assistant, and with the hands behind the neck. He attempts to sit up, once. The movement tests the abdominal muscles, including the psoas group.

Abdominals minus psoas. The subject starts in supine position with the knees bent, with the feet held down by an assistant, and with the hands behind the neck. He attempts to sit up, once. The movement tests the abdominal muscles, with minimum assistance from the psoas group.

Psoas. The subject starts in supine position with the legs straight and with the hands behind the neck. He attempts to raise the

straight legs to an angle of thirty degrees and to hold that position for ten seconds. The movement tests the psoas group and the lower abdominal muscles.

Upper back. The subject starts in the prone position, with a folded blanket under the abdomen, with the hands behind the neck, and with the feet held down in contact with the table or floor. He attempts to raise the trunk and to hold the position for ten seconds. The movement tests the upper back muscles.

Lower back. The subject starts in the prone position, with a folded blanket under the abdomen, with one cheek resting on his forearms, with the legs straight, and with the upper back held down to keep the chest in contact with the floor or table. He attempts to raise the straight legs and to hold the position for ten seconds. The movement tests the lower back muscles.

Length of back and hamstring muscles. The subject stands erect in stockings or bare feet, with the hands at the sides, with the feet together, and with the knees held straight by an assistant if necessary. He attempts to lean down slowly to touch the floor with the finger tips, and to hold the position for three seconds. The movement tests the flexibility or extensibility of the back and hamstring muscles.

Criticism of the Kraus-Weber tests. Numerous criticisms have been levelled at the Kraus-Weber tests. It is well to remember, of course, what the designers intended them to do. They did not pretend to test all aspects of fitness, nor to measure degrees of fitness above a minimum

level. Strength only, of a very few muscle groups, is actually tested. Neither muscular nor cardiovascular endurance is tested.

Other careful research has cast doubts on the tests. One example is the work of Ernie Nyhaug in New Westminster, which was reported by Howell and Mullins (16). Nyhaug tested 175 boys from thirteen to sixteen years of age. The tests were given four times with intervals of two days between tests. On the first test the failure rate was 56 per cent, on the second 16.8 per cent, on the third 10.8 per cent, and on the fourth 9.1 per cent, a figure comparable to the European failure rate reported in Chapter I. Two questions arise. Why did the boys fail the tests the first time ? Did the New Westminster boys become "fit" in ten days, on just these exercises ?

Further criticism has been directed by many investigators toward Kraus' method of determining total failure on his tests, i.e. failure on a single item. His defence has been that the tests require only minimum strength, therefore anything less than success on any item represents failure, because obviously the minimum has not been reached.

IV. MOTOR FITNESS TESTS

According to Clarke's analysis, given in the chart on page 7 of the present study, tests of motor fitness should include all aspects of general motor ability except arm-eye and foot-eye coordination.

The Canadian Physical Efficiency Tests (32)

The Canadian Physical Efficiency Tests have already been mentioned in Chapter I. The results of the application of these tests in Edmonton have caused local concern about physical fitness.

Preliminary to testing, each candidate is carefully weighed, measured for height, has his or her date of birth recorded, and is examined medically to insure normalcy of heart action. Height and weight are used in connection with a special chart to assign each individual a physique category, which amounts to a kind of ratio between height and weight. The physique category chart is included in the present study as the first page of Appendix A.

The test items are described below.

Organic (circulo-respiratory) efficiency test. After an initial rest, fifteen-second sitting pulse counts are taken at intervals of about one minute, until two consecutive counts agree, or differ by at most one count.

The subject next steps up and down on a bench of height determined by his physique category. The four-count step rhythm is identical to that required for the Tuttle Pulse-Ratio Test (page 18), except that fifteen full cycles per minute are required. The rhythm is given by a metronome set at 120 beats per minute, plus accompanying voice.

Four fifteen-second sitting pulse counts are taken, the first beginning fifteen seconds after the exercise, and each succeeding count separated from the foregoing one by a fifteen second interval. The total time taken for these counts is thus two minutes.

The raw score is obtained by taking the difference between the pre-exercise fifteen-second pulse count, multiplied by four, and the sum of the four post-exercise pulse counts.

Floor touch. The subject stands erect with the feet not more

than six inches apart, and the knees straight. He bends forward without any bounce and holds for three seconds the lowest position he can maintain. A raw score scale varies from ten points for palms touching the floor to one point for middle finger tips between nine and twelve inches from the floor. The test measures back and hamstring flexibility.

Shot put. The subject stands erect with the back in contact with a wall, and the heels from six to twelve inches from the wall. The put is made without body movement, even the putting shoulder remaining against the wall. The weight used depends upon the physique category. The raw score is the distance of put in feet and inches from a point between the feet and twelve inches from the wall. The event is conducted indoors using mats to protect the floor. The event tests explosive power of the arm and shoulder muscles.

Sit-up. The subject starts in supine position with the legs straight, the feet not more than three inches apart, and the hands interlocked behind the neck. He sits up to the vertical position (shoulder joint over hip joint) as many times as possible in one minute. The ankles are held by a partner, and back rounding is permitted. The raw score is the number of correct repetitions achieved. The event measures strength and endurance of the abdominal muscles.

Jump and reach. The standing one-hand reach is first measured; the subject stands facing a wall and stretches either hand upward as far as possible. A number of movable paddles are suspended from beams so that their lower tips are known heights above the floor. Using several attempts, the subject discovers the highest paddle he can jump and touch,

without a run, using the same hand as was used for the reach. The raw score is the difference, in inches, between the two measures. The event tests explosive power of the legs.

Hanging or chinning. Lower physique categories are permitted to hang from a bar at arms' length, the raw score being taken in seconds. Higher physique categories may take the hanging test if unable to chin. Chinning is performed with the palms toward the face. No kicking or swinging is allowed, the arms must extend fully between chins, and the chin must come level with the bar. The raw score is the number of completed chins. The event measures strength and endurance of the arm and shoulder muscles.

Standing three hops. The subject stands on one foot behind a take-off line, and takes three consecutive hops forward on the same foot without pausing between hops. The raw score is taken in feet and inches. The event measures leg power and coordination.

Endurance drop-off test. Subjects under thirty years of age run, as fast as possible, for a distance varying from forty-five yards in the lower physique categories to three hundred yards in the higher categories. An ingenious system of combined running circuits permits the use of a space sixty feet by thirty-five feet for all levels.

Older subjects are permitted to jog; those fifty-five years of age and over may walk. It is important that the subject runs (or jogs, or walks) as fast as possible from the very start.

Raw scores are taken at two points in the run, to the nearest tenth of a second. The first reading is taken as the subject completes

one third of his route, and the second at the completion of the entire route.

Conversion of raw scores to standard scores. The raw scores of all of the test events except the endurance drop-off test are converted to standard achievement ratings by single readings. The standard score scales have a six-sigma range, have a mean of fifty-five points, and provide intervals of five points from five to one hundred.

The endurance drop-off is treated as follows:

1. The time for the first third of the distance is converted to a standard score.
2. The "drop-off index" is found by subtracting three times the time for the first third from the time for the total distance. The "drop-off index" is then converted to a standard score.
3. The average of the two standard scores becomes the standard score for the event.

In a private letter to the present writer, Dr. Orban says that the standards for the six-sigma conversion tables were drawn from other authors who had used similar and comparable tests. The data were treated by what Dr. Orban terms "educated guesses", and were modified somewhat by tests on small selected groups of cadets and school children. He notes in his letter of July 31st, 1961, that standard scores based on data from the Canadian tests of 1957 are still in preparation in Ottawa.

Assessment of the Canadian Physical Efficiency Tests. Some criticisms which have been levelled at the Canadian Physical Efficiency Tests are worthy of note.

The present writer questions the complete elimination of the age factor in classifying subjects below the age of twenty-five. McCloy (23), Neilson and Cozens (31), and Cozens, Trieb, and Neilson (8) analyzed statistically the effects of age, height, and weight upon performance in many events. All of these authorities retained age as an important component of their scales. Various amateur sports organizations use age as the sole classification item.

Validity and reliability of the test items are not clearly established, the following statement from the manual being the only one on either topic:

> It has been established with some degree of confidence that the components of muscular and organic power as defined in this manual are measurable by the Canadian Physical Efficiency Tests. (32:10)

In his private letter, however, Dr. Orban mentions that his recent studies appear to indicate that the three hops, the drop-off test, and perhaps the shot put may be invalid and unreliable.

Edmonton observers of Dr. Plewes' testing in 1957 came to the conclusion that the jump and reach item might be unreliable, because of the possible effect of fatigue. Each subject was allowed as many attempts as necessary to determine which suspended paddle was his limit. Bad guessing in early attempts could introduce fatigue before the true limit was found.

The equipment required for the tests as administered by Dr. Plewes was bulky and cumbersome.

The tests appear to require the use of a number of assistants who require considerable training, and the test appeared to be time-consuming, in the Edmonton instance.

A good feature, in the opinion of the present writer, is the profile type of individual score card which was used. The subject's converted scores on the several test items are reported side-by-side on separate scales. The strengths and weaknesses and over-all status of the subject are apparent at a glance.

The United States Navy Standard Fitness Test (41)

The Navy Standard Fitness Test comprises five items, which are described below.

Squat-thrust. The squat-thrust test is a one-minute test of large-muscle speed, power, agility, and coordination. The subject starts at attention, then bends his knees and hips and places his hands on the floor in squat-rest position (count one), jumps his legs backward into front leaning rest (count two), returns to squat-rest position (count three), and returns to the erect position (count four). It is not required that the knees bend fully in the squat-rest position, but the feet may not start back before the hands are placed on the floor, within eight inches of the feet. The hips must be in line with the shoulders and heels in front leaning rest, and the subject must come erect at the end of each cycle. To score, one point is given for each completed cycle.

Sit-up. The subject starts in supine position with the legs straight, the feet one foot apart, and the hands clasped behind the neck. The feet are held by an assistant. The subject sits up, touches one elbow to the opposite knee, lies back, then sits up and touches the other elbow to the opposite knee. One count is scored for each knee-touch, and the exercise continues to exhaustion. Knees may bend slightly during the

sit-up, but must not do so when lying back, nor may the hands unclasp. Strength and endurance of the abdominal muscles are tested.

Floor push-up. The subject lies prone, with the hands on the floor beside the shoulders, the fingers pointing forward, and the toes tucked under. He maintains the body position while straightening the arms completely (count one). He lowers the body by bending the elbows until only the chest touches the floor, then straightens the elbows once more (count two. Hips may not lead shoulders, nor vice versa, in the upward movement. Strength and endurance of arm and shoulder muscles is tested.

Squat jump. The subject stands erect with his hands clasped, palms down, on top of his head. The feet are placed between four and six inches apart, and with one heel on a line with the toes of the other foot. The subject drops to a squat on the rear heel, then springs into the air (count one), reversing the positions of the feet in mid-air, and drops into squat on the other heel. He immediately springs into the air (count two) and reverses the feet once more, to continue to exhaustion. The item tests strength and endurance of the leg muscles.

Pull-up. Refer to page 4 of Appendix B of the present study for a description of the pull-up as required by the Navy.

Comments on the Navy Standard Fitness Test. Clarke reports a correlation of .49 between the Navy battery and the Rogers PFI (6:228).

The Navy instructions provide for warm-up before testing, pre-instruction and practice of the test items, and rest periods between the tests.

For the remainder of the present chapter, a page reference in parentheses refers to a previous description of the test item in the present study.

United States Air Force Physical Fitness Test (6:226)

The United States Air Force test battery seeks to measure cardio-respiratory endurance, muscular strength, speed, coordination, and power. The test items include unlimited sit-ups (page 34), pull-ups (Appendix B, page 4), and either an outdoor 300-yard shuttle run or a 250-yard indoor shuttle run. See page 8 of Appendix B of the present study for a description of one type of shuttle run. A great variety of shuttle runs have been devised by various testers. In the two under consideration, not only agility and coordination but speed and endurance are involved, because of the distance run. Clarke reports a correlation of .63 between the Air Force test battery and the Rogers PFI (6:228).

United States Army Physical Efficiency Test (6:227)

The United States Army test battery seeks to measure muscular endurance, circulatory endurance, agility, and coordination. The test items include pull-ups (Appendix B, page 4), squat jumps (page 35), push-ups (page 35), sit-ups (page 34), and a 300-yard outdoor shuttle run or a 250-yard indoor shuttle run or a one-minute squat-thrust test (page 34). Clarke reports a correlation of .80 between the Army test battery and the Rogers PFI (6:228).

Indiana Motor Fitness Tests (6:228)

The Indiana Motor Fitness test battery seeks to measure strength, velocity, motor ability, and endurance. Norms were established in 1944

for high school boys and girls (39:5-13), and in 1948 for boys and girls in grades four to eight (11).

The four test items for high school and elementary school boys and girls include straddle chins, squat thrusts for twenty seconds (page 34), push-ups (page 35), and vertical jump (page 30).

Straddle chins are performed with the assistance of a partner. Students are paired for approximate height. The subject lies supine, reaching upward. His partner stands erect astride him, and holds the lying partner's hands with a finger-hook grasp. The subject maintains heels, hips, shoulders, and head in a straight line, and pulls up by bending his arms until his chest contacts his partner's thighs firmly. The movement is repeated until the performance method deteriorates or the subject is exhausted.

Height scored in the vertical jump is measured to the nearest quarter inch.

A motor fitness score is calculated by adding the numbers of repetitions achieved in the straddle chins, squat thrusts, and push-ups, multiplying the sum by the height achieved in the vertical jump, and dividing the product by ten.

Norms for boys for these tests are based on McCloy's Classification Index I (23:96), which is also used in Edmonton in slightly modified form for grades four to nine.

At the senior high school level the test battery has a validity correlation of .77 when compared with a criterion of twelve motor fitness items. No validity evidence has been given below high school level.

The tests are important because there are few batteries designed

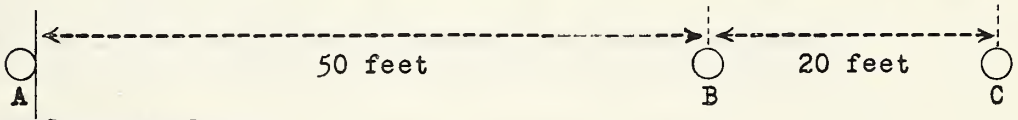
for the elementary school level.

The Oregon Motor Fitness Test (6:231)

The Oregon motor fitness test battery was designed by a statewide committee for elementary, junior high, and senior high school levels. A large number of potentially useful test items were selected for arm and shoulder girdle strength and endurance, abdominal strength and endurance, muscular power, running speed and endurance, and trunk flexibility. The test items were administered twice, by different testers, to random samples of appropriate sex and age groups, after which the items yielding low objectivity coefficient were discarded. The remainder were used as the criterion, and multiple correlation techniques were used to select three-item batteries which correlated most highly with the criterion.

The pull-up (Appendix B, page 4), the jump and reach (page 30), and the 160-yard potato race were selected for boys at all school levels.

The 160-yard potato race is best described by a diagram:



Starting line

All three circles are one foot in diameter. A wood block or blackboard eraser is placed in each of the second and third circles. The subject uses a standing start, runs to circle B, takes the block back to circle A, runs to circle C, takes that block back to circle A, takes the first block to circle B, returns to circle A and carries the remaining block to circle C, and finally runs back across the starting line. The blocks must be placed in the circles, not thrown. Time is scored in seconds.

The multiple correlation scores of the three test items ranged from .91 to .95. Scoring charts of the T-scale type are provided for the Oregon motor fitness tests.

The University of Illinois Motor Fitness Tests (6:234)

The University of Illinois motor fitness tests were developed by Thomas Kirk Cureton in 1947 (9). He analyzed motor fitness into six components: endurance, power, strength, agility, flexibility, and balance. Seven-item, fourteen-item, and eighteen-item batteries were validated against a thirty-item criterion. Validity of the fourteen-item test was reported to be .87.

The seven-item test included a dive and roll, a medicine ball put resembling a standard shot put, a bar vault, a pull-up (Appendix B, page 4), leg lifts and sit-ups (pages 26 and 30 respectively), breath-holding, and lifting a partner.

Pass-or-fail scoring is used; subjects of low ability are identified, but differentiation is lacking for those who pass.

The JCR Test (6:235)

In the JCR test essentially the same three test items are used as in the Oregon motor fitness test described on page 38 of the present study. The 160-yard potato race is replaced by a 100-yard shuttle run, in which the subject runs a ten-yard course ten times, using bankboards on the turns. Pull-up and vertical jump have been discussed.

The tests show reliability coefficients ranging from .91 to .97, and validity coefficients from .59 to .90.

California Physical Performance Test (38:6-17)

The California physical performance test battery was established in 1958 by the California State Department of Education. The test elements are arranged in five groups intended to evaluate the separate aspects of fitness as viewed by the test-makers.

In Group I the standing broad jump (Appendix B, page 9) and the jump and reach (page 30) are used to evaluate power, coordination, strength, flexibility of legs and body, and balance.

In Group II the pull-up (Appendix B, page 4) and the floor push-up (page 35) are used to evaluate strength and endurance of the arms and shoulder girdle.

In Group III the sit-up (Appendix B, page 7) is used to evaluate strength and endurance of the abdominal muscles.

In Group IV the fifty-yard or seventy-five-yard dash (Appendix B, page 10) and the shuttle race (Appendix B, page 8) are used to evaluate speed and endurance.

In Group V the softball throw for distance (Appendix B, page 10) and the basketball or soccer ball throw for distance are used to evaluate agility, coordination, body control, and strength.

It is the intention of the authors of these tests that teachers should select one test item from each of the groups outlined above.

Neilson and Cozens (31) produced both the age-height-weight classification formula and the standards for junior high schools for the California tests, in 1934. Cozens, Trieb, and Neilson (8) produced the high school classification system and standards in 1936.

The Physical Fitness Tests of the State of Iowa

The Iowa Program of Physical Education for Boys (40:243-255) identifies the elements of muscular strength and muscular endurance, agility, and circulo-respiratory endurance, as contributing to physical fitness. Coordinations are recognized as basic to athletic achievement, but not necessarily to physical fitness. Sprinting speed is not measured separately, because it is not considered to be important to physical fitness. It is measured as part of a method of determining an endurance rating, however.

Muscular strength and muscular endurance are viewed as being so closely interrelated that the same test will suffice for both elements, called jointly "muscular condition".

Muscular condition, as defined above, is tested by pull-ups, floor push-ups, squat jumps, and two-minute sit-ups. Pull-ups require the palms to be toward the face, otherwise the test is identical to that described on page 23, including the feature of disqualification after four imperfect performances, termed half-counts. Push-ups are identical to those described on page 35, but also include disqualification after four half-counts. Squat jumps are the same as those described on page 35. Sit-ups are identical to those described for the AAHPER Youth Fitness tests (Appendix A, page 7), except that the performer's legs are held down and spaced by the legs of his partner.

Agility is tested by the squat thrust, which is identical to that described on page 34. The best of three twenty-second trials, or a single sixty-second trial, comprises the test.

Circulo-respiratory endurance is determined by measuring both a

sprinting and a distance running speed of each subject. The method of determining these measures is next described.

Sprinting speed is tested by the device of measuring the distance run in six seconds. The running track has cross lines limed at two-yard intervals from thirty-four to fifty-six yards. Pupil judges are carefully taught how to mark the position of a runner at the moment the six-second whistle blows. A number of boys run at once, thus reducing administration time.

Distance running speed is measured over two hundred yards, the run being taken along a one hundred-yard straight-away, around a stake, and back along the same straight-away. Timing is done by the timer calling out the seconds and half-seconds, the syllable "hup" denoting the half-seconds. Pupil judges note the spoken times as their partners cross the line.

Distances run in six seconds form the horizontal axis of a table, while times taken to run two hundred yards form the vertical axis. From the body of the table are read endurance point scores.

The theories underlying this endurance ratio procedure are, firstly, that a person's sprinting speed is limited by factors which bear little relationship to physical fitness, and secondly, that his distance running speed is limited by and should be related to his sprinting speed. Thus a slow sprinter's seemingly slow distance speed may yield a higher endurance point score than a fast sprinter's seemingly better distance speed.

For indoor use, the Iowa program provides a substitute measure of circulo-respiratory endurance, involving yards run on a twenty-yard shuttle course in six seconds, and eight laps of the same course for the longer run.

The Youth Fitness Tests of the American Association for Health, Physical Education, and Recreation (AAHPER)

The AAHPER Youth Fitness Tests Manual (18), published in 1959, contains directions for the administration of seven test items, together with tables of norms for their use. The norms were the result of a testing program conducted with 8,500 boys and girls in a scientifically selected sample covering the entire United States. The test items include pull-ups (with palms away from the face), sit-ups, a shuttle run of forty yards over a ten-yard course, the standing broad jump, the fifty-yard dash, and the 600-yard run-walk.

All published details of the AAHPER test battery are contained in Appendix B of the present study.

V. GENERAL COMMENTS ON STRENGTH AND MOTOR FITNESS TESTS

When various test batteries are compared, it can be seen that a great deal of overlapping occurs in use of test elements. It might be possible to construct a useful test battery by selecting those test elements recurring most frequently.

Criteria against which various test batteries have been validated appear in several cases to have been larger groupings of test elements considered by empirical evidence and by authoritative opinion to involve the qualities to be tested.

Several investigators have tried to reduce the number of items in tests to the absolute minimum. For example, the older United States Navy Fitness Test of five items has been reduced to three in the United States Air Force Physical Fitness Test. In designing the Oregon Motor Fitness Test for schools, a large number of preliminary items were reduced to

three. In the opinion of the writer, such short tests are not desirable in all respects. While administrative simplicity is gained by such reduction, certain other purposes of evaluation as outlined on the first page of this study are defeated. These items include the diagnosis of individual strengths and weaknesses, the motivation of pupils' efforts, and the value of test activities as teaching procedures. It has been the experience of the writer that children enjoy doing physical fitness test items, and that there is merit in presenting children with a well-chosen variety of such items rather than with an arid few, no matter how valid they might be, statistically.

CHAPTER III

DELIMITING THE TASK AND SELECTING AN INSTRUMENT

I. REVIEW OF BASIC REASONS FOR THE PRESENT STUDY

The following submissions are made in the light of evidence presented in Chapters I and II of the present study:

1. That measurement has a number of contributions to make to education in general, and to physical education in particular.
2. That some of the objectives of physical education parallel those of other subject areas in general education, but that the objectives of physical development are unique to physical education.
3. That there probably exists a condition of basic physiological fitness, somewhat separate from physical fitness for specific activities, and somewhat separate from fitness of specific body components.
4. That the condition of physiological fitness can be analyzed into elements which also contribute to a somewhat broader concept of physical fitness which may be termed motor fitness.
5. That the development and maintenance of motor fitness is a responsibility of physical educators.
6. That motor fitness, including physiological fitness, can be measured by separate measurements of its various components.

II. LIMITING FACTORS IN THE EDMONTON PUBLIC SCHOOL SITUATION

<u>A First Attempt</u>

The present study is the first attempt to establish norms for any battery of motor fitness tests for the Edmonton Public Schools as a whole system. A few Edmonton teachers have from time to time made use of test batteries normalized elsewhere. William D. McLean of Bonnie Doon Composite High School, and James T. Gilfillan of Strathcona Composite High School, have made use in their own schools of some of the Iowa physical fitness test items discussed in Chapter II. Jack W. Allen, formerly of Eastglen Composite High School, constructed tables of standards, for use within that school, of a combined daily program and test battery based on the "5BX" program developed by Dr. William A. R. Orban (36). Other teachers may have conducted similar experiments without the knowledge of the present writer.

Availability of Equipment

It was not possible to provide the equipment required for several of the tests outlined in Chapter II. The following items would have been required: metronome (to set rhythm for step-test items), benches of unusual heights, sphygmomanometer (to test blood pressure), standard clinical stairs, wet spirometer (to measure lung capacity), hand dynamometer, and leg and back dynamometer. Other needed items were relatively common: stop watches, steel tapes, and shots of different weights, and weighing scales. Horizontal bars, required by many of the possible test batteries, were unfortunately not available in very many schools.

Obviously, whatever test battery was chosen would have to depend upon readily available equipment.

Teacher Qualifications

Of the forty-four junior high school teachers who administered the test project which is the basis of the present study, at most fifteen could be classified as qualified in physical education, by either training or experience, or both. Of these, not more than six had any special training in physical education testing and measurement. All but one of the fifteen senior high school teachers who contributed data possessed either a degree in physical education or were physical education majors within education patterns. The remaining teacher was experienced in specific activities. Eleven of the fifteen had received undergraduate training in testing and measurement.

In the total of fifty-nine teachers of physical education, only seventeen had some knowledge of testing procedures. An instrument requiring advanced techniques would obviously have been unsuitable.

Time Allotted to Physical Education

In all of the twenty-nine junior high schools from which data were gathered, two thirty-five minute periods per week were allotted to physical education. Any testing instrument chosen would therefore have to make minimum inroads on time precious to the program proper.

III. CHOOSING THE TEST INSTRUMENT

Rejection of Tests of Physiological Fitness, Flexibility, and Strength

Crampton's Blood Ptosis Test, the Barach Energy Index, the Schneider Test, and the McCurdy-Larson Test of Organic Efficiency were all ruled out immediately because of the need for a sphygmomanometer to read blood pressures. The Tuttle Pulse-Ratio Test and Harvard Step-Test were ruled

out because of poor correlation with athletic activities. These tests are all discussed in Chapter II.

Measures of hip and back flexibility were rejected because of their low correlation with motor ability tests. The topic is discussed in Chapter II.

The Rogers Physical Fitness Index Battery, together with its revisions by the Oregon authorities and by C. H. McCloy, were ruled out with regret, because of the need to purchase dynamometers. These tests are discussed in Chapter II. The Kraus-Weber tests were ruled out because of the pass-or-fail type of scoring, and because of the absence of an organic fitness item. The Kraus-Weber tests are mentioned in Chapter I and discussed in Chapter II.

Reasons for Rejecting Certain Motor Fitness Tests

Of the motor fitness tests, the most attractive to the writer were the Oregon Motor Fitness Test, the Canadian Physical Efficiency Tests, and the Iowa Physical Fitness Tests, all discussed in Chapter II, and the AAHPER Youth Fitness Tests, described in Appendix B.

The Oregon Motor Fitness Test was particularly attractive because of the state-wide sampling and careful statistical treatment, its three items being very economical of time, and no unusual equipment being needed. The test was rejected for two reasons. Even if three items are statistically representative of a much larger group of original items which in turn represent the program of activities to be evaluated, the three items are not so representative in the minds of school boys, who will inevitably practice items which they know will be used as tests. Such practice should

obviously be of an all-round selection of events. Further, a test of three events will not provide the diagnosis of strengths and weaknesses in other muscle groups not involved in the test items.

The Canadian Physical Efficiency Tests were rejected with regret. The organic efficiency test, which requires very accurate use of metronome and stop-watch, and the endurance drop-off test, which requires very accurate use of the stop-watch, appeared to be beyond the administrative ability of beginning, untrained teachers. The organic efficiency test permits several students to be tested at once, but the endurance drop-off test does not permit this, therefore the time commitment for this item is excessive. Other criticisms are contained in Chapter II.

There has been no report of the Canadian Physical Efficiency Test results in United States periodicals reviewed by the writer, nor in the Journal of CAHPER.

Certain features of the Physical Fitness Tests of the State of Iowa were attractive, particularly the measure of circulo-respiratory endurance, the four half-count disqualifications, and the method of administering the sit-up test. However, the scoring tables appear to ignore classification systems involving age, height, weight, or a combination of these factors.

Reasons for Choosing the AAHPER Youth Fitness Tests

The AAHPER Youth Fitness Tests (see Appendix B) were chosen for the purposes of the present study. Reasons for this decision were numerous.

Agreement among differing authorities. The AAHPER Youth Fitness

test battery is the only one ever undertaken in the United States as a national project. No other test reviewed in the present study has achieved this distinction. Each of the other tests has many merits, and strong partisan advocates, but until President Eisenhower's Council on Youth Fitness (see Appendix B, page 1) made definite request for them to do so, these divergent authorities had not been able to agree on a common procedure.

The second pressure upon the members of AAHPER was the public interest aroused by the article in "Sports Illustrated" (2). It is extremely interesting to note that under these urgent circumstances, the best research minds of AAHPER produced such an uncomplicated test battery !

Financial support by AAHPER. The Youth Fitness Test Project was financed by AAHPER, which fact appears to the writer to be an endorsation of the test.

Simple, familiar test elements. The AAHPER Youth Fitness Test is composed of elements familiar to or readily comprehended by boys and girls, their parents, and teachers, even those without special training in physical education.

A balanced sample of test items. The test items are so chosen that they cover the chief muscle groups, and also the elements of motor fitness. The practice of these elements alone will provide a balanced sample of exercise which will improve motor fitness.

Minimum equipment requirements. Only equipment regularly supplied for physical education purposes is required to administer the tests.

The California physical performance test (38). It is significant that six of the seven performance items of the AAHPER test are identical with performance items of the California physical performance test. Reference to Chapter II and to Appendix B will confirm this point. The California program of physical education, including its testing program, is widely recognized to be of high calibre. In the view of the writer the similarity between the two test batteries is an endorsation of the AAHPER tests.

Possibility of an international youth fitness test. The writer believes that public understanding of motor fitness would be improved by use of the same measuring instrument in different districts, states or provinces, and countries. Inasmuch as AAHPER has developed an acceptable test battery with full national coverage, it is suggested that Canadians should make use of the same tests.

IV. DELIMITING THE TASK

It was decided to limit the scope of the project in various ways, in order to reduce it to proportions reasonable at the Master's thesis level.

Sample to be Tested

It was decided to test boys only in Grades VII, VIII, IX, and X, and in Physical Education 20 classes, in which a limited number of Grade XI boys and a very few Grade XII boys enroll.

It was further decided to attempt a test of the whole sample, for two reasons. In the first place the project was viewed by the Edmonton

Public School Board authorities as an in-service training session for their teachers. In the second place, it was important to secure as many cases as possible in the upper and lower categories of classification, in order that norms for these groups should be as reliable as those anticipated for more central classification groupings.

Percentile Norms

It was decided to calculate norms in percentile form, partly because this method is easily understood by students and their parents, and partly because the AAHPER test manual was produced with norms in that form.

It was anticipated beforehand that distribution of certain data would be skewed. Ehrlich (10) discovered positive skewness in scores for the one-hundred-yard dash, a maze run, pull-ups, and other items. Cozens, Trieb, and Neilson (8:154) used special techniques in constructing their standard scoring scales for pull-ups and several other test items because of skewness. It was felt that percentile norms would compensate in part for the expected skewness.

It was decided to calculate norms only, i.e. to assess existing abilities of the boys. No attempt would be made in the study to establish standards of desirable performance.

Classifications

It was decided to classify the boys in the following ways:

1. All boys: according to age in years at the last birthday. This method was used by the AAHPER testing group.
2. Junior high school boys: according to McCloy's Formula No.1 (23:95), using age, height, and weight, as applied in the

Edmonton public school system. This classification system has been used for at least the last twenty years in Edmonton schools. The method was not used by the AAHPER testing group. The Edmonton method is detailed in Chapter V.

3. Senior high school boys: according to the Cozens-Trieb-Neilson (California) Classification Index of age, height, and weight (8:13). This method was used by the AAHPER testing group.

Further Classification Data for Future Study

For the purpose of making the data more useful for future study beyond the limits of the present project, it was decided to make certain extensions and additions to the classification procedures outlined above.

1. All boys would be classified according to the California Classification Index.
2. All junior high school boys would be classified according to the Neilson-Cozens (31:6) age-height-weight chart used by the AAHPER testing group.
3. Provision would be made for the future classification of the senior high school boys by the McCloy Formula No.1.
4. All boys would be classified according to the Canadian Physical Efficiency Tests physique category chart included in the present study as the first page of Appendix A.

CHAPTER IV

EXPERIMENTAL DESIGN

I. THE AAHPER YOUTH FITNESS TEST MANUAL

The AAHPER Youth Fitness Test Manual was taken as the basis for conducting the tests in the Edmonton schools. The complete manual is included in the present study as Appendix B.

II. PERMISSION TO CONDUCT THE PROJECT

Besides having the Edmonton test project approved by the University authorities, for thesis purposes, it was necessary to obtain permission from the Edmonton Public School Board authorities to conduct the project in the school system. The sequence of procedures is given here in order to assist other teachers who may wish to conduct similar experiments.

A letter to Mr. A. Stuart Bird, Supervisor of Physical Education for the Edmonton Public Schools, outlined briefly the general arguments contained in Chapters I and III of this study, and asked permission to conduct the test project as a desirable item in the physical education program. Mr. Bird was pleased to authorize the project, and noted the value of local assessment of testing materials developed in other parts of the world. (See Appendix A).

A letter to Mr. George R. Conquest, Assistant Superintendent for Secondary Education, requested permission to use the data obtained from the project for thesis purposes. Mr. Conquest very kindly granted his permission. (See Appendix A).

III. BRIEFING THE PHYSICAL EDUCATION TEACHERS

Preliminary Letter to the Teachers

The supervisory personnel in the Edmonton Public School system act in an advisory capacity, somewhat similar to the role played by military staff officers. Direct authority is exercised by the various principals, who in turn act under the direct authority of the Superintendent of Schools. It is therefore necessary for supervisors to inform teachers fully and give logical reasons for any unusual projects which may be contemplated. For these reasons a carefully prepared letter was circulated to all teachers of boys' physical education.

In summary, the letter announced the date and time of the voluntary in-service session, and presented the most important reasons for conducting the project. The teachers were urged to attend the session, and to accept the testing unit as part of their fall programs. Further, they were asked to bring to the in-service session for calibration the measuring tapes and stop-watches which they would be using to administer the test events. The letter also attempted to give a fair appraisal of the out-of-school time which the teachers would be requested to contribute if they consented to undertake the project. (See Appendix A).

Response by the Teachers

Two group briefings were conducted by the writer. Forty-eight teachers attended the first session. Eight others attended a second session held at their own request. Three others were briefed privately. One high school teacher was briefed by the head of the physical education department in his school, a fully trained physical educator. The remaining

nine teachers of the total of sixty-nine on staff were unable or unwilling to undertake the project. Of the sixty who did undertake to conduct the test, one had his data accidentally destroyed before he could return it. Unfortunately he was a fully qualified, experienced teacher.

Details of the Briefing Sessions

The contents of the briefing sessions as here reported summarize printed materials presented by the writer combined with many valuable suggestions from the teachers. All teachers were provided with the complete resulting instructions. All directions for administering all test items are contained in Appendix B. The present section of the study merely presents adaptations used in the Edmonton situation. Test items were demonstrated by the writer, then practised, scored, and discussed by the teachers.

Motivation of the boys. All teachers agreed to explain the purposes of the project in suitable terms to their classes, answer their questions, and emphasize the fact that all classes in the city would be doing the same things at the same time. It was suggested that teachers should encourage rivalry between classes, and between neighboring schools. It was agreed that teachers should by voice and action encourage the boys to maximum efforts.

Warm-up before testing. Most classes in the city were using some modification of the "5BX" series (36) as regular warm-up in their classes. It was agreed that all should adopt a moderate warm-up of this type.

Class organization and control. The test unit was planned for

the first two weeks of October. It was ascertained that all teachers had completed the teaching of soccer or of touch or flag rugby football units during September, and would be able to arrange intra-class round robin schedules for the sections of their classes not actually being tested. It was emphasized that close control of these game situations would be necessary. Careful instruction of student leaders, pre-arranged schedules, and regular reporting by the student leaders to the teacher were agreed to be necessary precautions.

Age data. Ages were to be calculated for October 1st, 1959. It was desired to avoid asking teachers to obtain the dates and years of birth from the cumulative record cards. It has been the experience of many teachers that many students do not know the year of their birth, and frequently make errors in calculating it. However, they do know their ages and their birthdays. In order to avoid the labor of the first alternative, and the errors which would result from asking the boys to give their birth years, it was decided to ask the boys two simple questions, and record the answers:

1. "How old will you be (or "are you", or "were you") on Thursday, October 1st, 1959 ?"
2. "What is your birthday ?"

The form of the first question depended upon whether the question were asked before, on, or after October 1st. From the answers to the two questions it was possible to obtain the boys' ages in years and months, to the nearest month, by use of the conversion table contained in Appendix A of the present study.

Height data. All schools are supplied with regularly inspected height and weight scales by the city health department. Two different models of these machines were provided at the briefing.

The height scale on one machine recorded feet and inches, and the other inches, both in quarter inches. Teachers were shown how to check for errors in the scale by use of an accurately measured stick, to check posture and body alignment of subjects, to recognize readings in feet and inches and convert them to inches, and to record heights to the nearest half inch. A reading exactly at a three-quarter inch point was taken to the next full inch reading above, while a reading exactly at a one-quarter inch point was taken to the next half-inch reading above. Teachers were given practice in measuring each other. Heights were taken in bare or stocking feet.

Weight data. Differences in calibration of the two weight scale bars were explained. Teachers were shown how to check scale platforms for free suspension on knife-edge supports, and balance the calibrated bar at zero. They were given practice in weighing each other.

Weights were taken throughout most of the junior high school system with the boys in T-shirts, underwear shorts, trousers, and bare feet. The use of gymnasium shorts for junior high school physical education classes was not general at the time of the tests.

In the senior high schools and a few junior high schools weights were taken in T-shirts, gymnasium shorts, and bare feet.

Calibration of stop-watches. The writer had two new stop-watches checked for accuracy by a watch-maker. After practicing response to a

rhythmic starting signal, all teachers started their watches at the same instant, and let them run for five minutes. They were stopped in response to a rhythmic signal, and readings were compared. Teachers were requested to record and memorize the errors of their own watches as compared with the official watches. A stop-watch correction sheet (see Appendix A) was issued to each teacher. Actual watch-errors were all under one second over the five-minute run.

Calibration of tapes. A steel tape was stretched on the floor to a length of fifty feet, and the various tapes (cloth or steel) brought by the teachers were laid against it. The maximum error in any tape was one-half inch in fifty feet, therefore this was disregarded in all cases for measurements of running distance and softball throw. Where errors did occur, it was discovered that these were located in the first ten feet of cloth tapes. Teachers possessing these tapes were instructed how to allow for the error before recording measures in the standing broad jump.

Pull-up (Appendix B, page 4). It was necessary to devise emergency chinning bars, because only three of the five high schools and three of the thirty junior high schools undertaking the project were equipped with horizontal bars. A $4\frac{1}{2}$-foot piece of 1 5/16-inch fir or hardwood dowelling, or a similar length of one-inch pipe (1 5/16 inches outside diameter), were the suggested alternatives. It was suggested that these be suspended from the top-bars of soccer goal posts, which are eight feet above ground, or from basketball backboard brackets indoors, which are well over nine feet above ground. In either case, it was discovered that suspension

could be achieved by use of several skipping rope lengths of sash cord at each end of the bar, a series of tight clove hitches preventing rotation of the bar.

Two boys could perform pull-ups at once on the bars described, therefore it was agreed that teachers test half of a class at one time, providing other activity for the remaining half. The two boys immediately following the subject in each of the two files assisted the teacher in counting pull-ups.

Sit-up (Appendix B, page 7). Teachers agreed to occupy the whole class at once in the sit-up by organizing the boys in threes, one boy performing, one holding his feet and counting sit-ups, and the third refereeing form as well as counting sit-ups.

Shuttle run (Appendix B, page 8). It was noted that volleyball courts should be thirty feet across, the required space for the shuttle run. Teachers agreed to check these courts by careful measurement before using them as test areas.

Because most teachers could obtain but one stop-watch, it was agreed that boys from two different files should run simultaneously, but only one would be timed, the other acting as "pacer". One half of each class would be tested at a time, the other half being provided with other activities.

Starting procedures were discussed. Teachers preferred to use a downsweep of the arm along with a verbal command in all running events. They decided to attempt to start the watch at the mid-point of the arm sweep.

Standing broad jump (Appendix B, page 9). Teachers agreed that two files could perform the standing broad jump at once, with able boys marking and measuring under the teacher's supervision, and the teacher recording. One half of the class was to be tested at a time, the other half being assigned other activities.

Fifty-yard dash (Appendix B, page 10). Teachers decided to run the fifty-yard dash across wind, or against the wind if absolutely necessary. Two files were organized as in the shuttle run, but here the "pacer" ran twenty-five yards or less, timing his start when the timed runner was a few yards from him. This device was introduced so as not to tire the "pacers" for their own sprint attempts.

Half of each class was tested at one time, the other half being assigned other activities.

Starting procedures varied. Most teachers started runners from the finish line, using an arm sweep as described, and having a senior boy judge false starts. A few started and timed from the starting line, having a senior boy use an arm downsweep at the finish line to signal the runner crossing it.

Softball throw (Appendix B, page 10). Teachers decided to have boys throw across wind, or against it if absolutely necessary. One-third of each class acted as throwers, one-third as markers (each one matched with a throwing partner), and one-third as retrievers (again matched with partners). The method made the use of stakes unnecessary. All throwers threw in succession, impact points were marked, and balls were retrieved. The procedure was repeated twice more, markers moving to new impact points

only if distance was improved. Measurements were then taken and recorded, after which throwers became retrievers, retrievers became markers, and markers became throwers. The entire procedure was then repeated twice more.

Six-hundred-yard run-walk (Appendix B, page 11). Various methods of laying out a running track for the 600-yard run-walk were discussed. Many teachers used some modification of the goal-post layout suggested in Appendix B, page 12. Others used the fifty-yard square suggested on the same page. The high schools equipped with quarter-mile tracks used them.

Two alternative methods of starting line-up were discussed. In the first, all runners lined up on the same starting line, as is common in middle-distance track racing. In the second, each runner was given a separate starting line which was also his finish line. In the second case all distances run were identical, but competition between individuals was not as clearly defined.

Each entire class was in the test group, one-third running, one-third (partners) noting times called out at the finish, and one-third (also partners) resting and also checking times.

At the briefing teachers practiced the method of calling out finish times in minutes and seconds. Most watches had thirty-second dials, therefore teachers had to learn to read the small minute hand or to total up completed half-minutes properly.

Recording of Raw Data

Multilithographed forms for the recording of test data were distributed at the briefing sessions. These raw data sheets gave directions

for recording performances and other data in the correct number of digits required for IBM card punching. A sample raw data sheet is included in Appendix A.

The Testing Schedule

The test administration schedule suggested to the teachers was as follows:

1. Week of September 28th: take ages, heights, and weights, and collect equipment.
2. Week of October 5th: administer pull-ups, sit-ups, and shuttle run.
3. Week of October 12th: administer standing broad jump, fifty-yard dash, and softball throw.
4. Week of October 19th: administer 600-yard run-walk, and complete the Classification Sheet (see Appendix A).

Unfortunately the weather in the fall of 1959 was the coldest and wettest for many years. In spite of this fact many of the teachers actually finished all of the tests, although it was not until November 13th that a final halt was called. Snow fell about October 13th, and melted very slowly. Grounds remained wet and the weather cold for the next ten days; the weather warmed only intermittently from then until winter.

The 600-yard run-walk and the softball throw were the test items most affected by the weather. In an effort to make the data that was turned in for these test items as reliable as possible, teachers were instructed in a bulletin issued by the Superintendent of Schools:

> Note about performing outdoor items in cold weather. The Canadian Army and Air Force recommend that heavy clothing be worn up to the moment of performance of heavy exercise, that the performer strip

down for the actual event, and that the heavy clothing be resumed immediately afterward. In this way performance is maintained, and colds can be avoided. It is suggested that all organization be "dry-run" in the gymnasium before going outdoors.

IV. CLASSIFICATION COMPUTATIONS PERFORMED BY TEACHERS

Data and Classification Forms

Special classification sheets were distributed at the briefing sessions. These sheets were designed to be glued to the right-hand end of the raw data sheets, thus permitting the classification calculations for a given individual to follow the raw data in a horizontal line. A sample classification sheet is included in Appendix A.

Classification Systems Used

The teachers were asked to complete the following items on the classification sheet:

1. Conversion of years of age and birthday to age in years and months, by use of the table contained in Appendix A.
2. Classification by the Neilson-Cozens system (31:6), for junior high school boys only, by use of the table on page 29 of Appendix B. This classification system was not used in the present study. It is available for possible future study of the relative merits of various classification systems.
3. Classification by the Cozens-Trieb-Neilson system (8:13), for all boys. Instructions for use of this system are included in Chapter V. The system was used for senior high school boys only in the present study. Its application to junior high school boys provides material for future study.

4. Classification by the McCloy Formula No.1 (23:95), for junior high school boys only. Instructions for use of this system are included in Chapter V.

V. VERIFICATION OF THE DATA

Interviews with the Teachers

After the return of the data, the writer interviewed each contributing teacher separately, covering in detail every possible aspect of the testing as conducted by that teacher. A check-list of discussion points was duplicated and used in each interview. A condensed version of the check-list is included in Appendix A. As a result of the interviews, various sections of data were ruled inadmissible.

In scoring pull-ups the AAHPER Test Manual (Appendix B, page 4) specifies the recording of "completed pull-ups to the nearest whole number". One teacher interpreted the printed version to mean that achievement of an angle at the elbow of less than ninety degrees on the final pull-up should count as a full pull-up. In the opinion of the writer the AAHPER Test Manual instructions are made ambiguous by the use of the words "to the nearest whole number". However, the writer had access to the mimeographed material used by Dr. Hunsicker in the original American national project. The original wording was:

> The pupil's performance shall be recorded as the number of correctly executed pull-ups after extension of the arms. In other words, each correctly performed up-and-down movement counts as one pull-up.

All other teachers had interpreted the scoring of the event in the manner indicated by the quotation, therefore the data from the teacher mentioned above were discarded. A total of 5,111 performances was accepted.

For the sit-up, the AAHPER Test Manual is explicit in its printed directions (Appendix B, pages 7 and 8). The feet must be about two feet apart, and elbows must be flat on the mat before starting each sit-up. Demonstration and practice at the briefing adhered to these points. Unfortunately the illustrations (Appendix B, page 6) appear to belie the instructions. As a result data from a number of teachers had to be discarded. Further data were discarded because teachers misinterpreted the action sequence and method of count. A total of 3,884 performances was accepted, the lowest total for any test item.

In the shuttle run, a few teachers misinterpreted the finish of the action sequence, requiring their runners to place the second block at the finish line, rather than run it through. These cases were discarded. A total of 4,928 performances was accepted.

The administration of the standing broad jump was generally good. A few sections of data were ruled out because jumpers had not completed three trials. A total of 5,098 performances was accepted.

The bad weather somewhat reduced the quantity of data approved in the fifty-yard dash. A total of 4,774 performances was accepted.

The bad weather made inroads on data from the softball throw. Some data were also disallowed because the rear restraining line was not used. Further data were discarded because of measurements being recorded in five-foot intervals, instead of to the nearest foot, and still more because three trials were not completed. A total of 4,208 performances was accepted.

The weather badly affected returns on the 600-yard run-walk, but the item was well administered, therefore very little data had to be dis-

carded. Two teachers attempted the event indoors in a gymnasium, but the data were disallowed because of the unknown effect of sharp unbanked turns. Their course was measured exactly and lap-counts were properly kept, but no account was kept of the considerable extra distance run because the boys were running outside the measured line. A total of 4,485 performances was accepted.

Observation of Actual Testing

The writer was able to visit a number of teachers during the testing schedule, and to assist in a few cases. It was possible to correct a few errors in procedure, thereby preserving data which would otherwise have been inadmissible.

The Problem of Birthdays Near October 1st

The procedure for taking age data was explained earlier in the present chapter, on page 57. The system worked well for all boys except those whose birthdays fell on or near October 1st. Unfortunately some teachers and many boys did not understand the necessity for answering the two questions exactly as posed, even though the questions were being asked on some day after October 1st. As a consequence many boys reported their ages with the extra year added for birthdays falling after October 1st. Because the year of birth was not reported, it was impossible in such cases to detect which boys had made the error, and which had not.

The problem was solved by asking the teachers concerned to check the cumulative records of the boys in question, telephoning the school secretaries, or telephoning the homes of some boys. In order to be sure all doubtful cases were taken into account, all boys with birthdays in

the last week of September and the first two weeks of October were checked.

Recalculation of Classification Sheet Entries

All of the following computations completed by the teachers, or in some cases partially completed by them, were carefully reviewed and corrected where necessary:

1. Conversion of age in years, and birthday, to age in months.
2. Extractions of age, height, and weight indices from the three classification tables used.
3. Addition of the indices, classification of the totals, and assigning code numbers to the totals for IBM purposes.

At the same time the writer used the heights and weights to classify the boys according to the physique category chart of the Canadian Physical Efficiency Tests (Appendix A). The physique categories are not used in the current study; they are available for possible future study.

VI. IBM CARD PUNCHING AND SORTING

Data had been recorded for a total of 5,692 boys. All of these provided at least age and one performance item. Forty-one of these boys lay in age groups below eleven years or above seventeen years, therefore their data were not compiled by the age classification method. One hundred ten junior high school boys and three senior high school boys had not been weighed or measured, therefore they did not contribute data to the McCloy or Cozens-Trieb-Neilson classifications, respectively.

Code numbers were assigned to permit the identification of each card by school, teacher, grade, physical education class, and pupil number. The IBM card column numbers for identification, performance data, and

classification data can be read from the small figures at the top or bottom of the columns on the sample raw data and classification blanks contained in Appendix A.

All data were recorded on 5,692 IBM cards, fifty-eight of the available eighty-four columns being used on each card. Each card was passed through both the IBM punching machine and the IBM verifying machine. The verified cards were sorted on the IBM sorting machine. All three of the IBM machines mentioned were made available by the Faculty of Education at the University of Alberta.

Cards were first sorted according to age in completed years. Performance data for each age group were then sorted for each test item, column by column, the frequencies being recorded from the machine dials on duplicated matrix sheets designed to accommodate data from any one of the test items.

Cards were then sorted into junior and senior high school divisions. The junior high school cards were sorted into McCloy classifications, while the senior high school cards were sorted into Cozens-Trieb-Neilson classifications. Each of these divisions was then sorted for each test item, the frequencies again being recorded on the matrix sheets.

An example of a completed matrix sheet is contained in Appendix A.

VII. COMPUTATION OF PERCENTILE NORMS

From the IBM card-counting process frequencies were tabulated for every performance scale unit value required by the directions for administering the test items, rather than in class intervals. Frequencies for pull-ups were tabulated at one pull-up intervals, for sit-ups at one sit-up

intervals, for the shuttle run and fifty-yard dash at one-tenth second intervals, for the standing broad jump at one-inch intervals, for the softball throw at one foot intervals, and for the 600-yard run-walk at one second intervals.

It was decided, therefore, to obtain cumulative totals by adding the frequencies directly on the matrix sheets. The cumulative frequencies at every fifth percentile level were next tabulated, and finally the position of each desired cumulative frequency was located in the matrix sheet, and the exact performance scale value was extracted. The entire process of computing percentile norms is illustrated in the completed matrix sheet in Appendix A, wherein data for the softball throw in the fifteen-year age group are treated.

CHAPTER V

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHARTS FOR EDMONTON PUBLIC JUNIOR AND SENIOR HIGH SCHOOL BOYS

I. HOW TO USE THE TABLES

The scoring tables and profile charts on the following pages are performance norms based on the Youth Fitness Tests of the American Association for Health, Physical Education, and Recreation (AAHPER). They are the result of the test project conducted in the Edmonton public schools during October, 1959, and are presented in the form of percentile scoring tables.

The Meaning of Percentiles

The usefulness of the scoring tables will depend upon a clear understanding, by teachers, students, and parents, of the meaning of percentiles. They do not mean the same thing as the percentage marks usually used for academic subjects in the schools.

Percentiles may be defined by the use of an example. The seventy-fifth percentile is that point below which 75 per cent of the performance scores lie. It is also true that 25 per cent of the performance scores lie above the seventy-fifth percentile point. Suppose a fifteen-year-old boy is able to throw a softball 167 feet. He may be scored on this event by reference to Figure 2, on the next page. A throw of 167 feet is located at the sixty-fifth percentile level, which means that 65 per cent of fifteen-year-olds cannot throw as far as he can, while 35 per cent of them can throw farther.

The Achievement Profile

Suppose the same fifteen-year-old boy achieves 5 pull-ups, 45 sit-ups, 9.8 seconds in the shuttle run, 6 feet 4 inches in the standing broad jump, 6.8 seconds in the 50-yard dash, 167 feet in the softball throw, and 2 minutes 2 seconds in the 600-yard run-walk. Each of these scores should be circled, or written in and circled, in the appropriate performance column on the scoring sheet. See Figure 2, below. Some special cases should be noted. In the pull-up column circle the middle 5 of the three available. In the shuttle run column, circle a point midway between the two 9.8 readings available. In the 600-yard run-walk column, the actual performance score of 2:02 should be written between 2:01 and 2:04, and then circled. Finally, the centres of the circles (or ellipses) should be joined by straight lines to complete the "profile", which shows high and low points as relative strengths and weaknesses.

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
75	6	69	9.6	7' 0"	6.8	175	1:51	75
70	6	61	9.7	6'11"	6.9	172	1:53	70
65	5	57	9.8	6'10"	6.9	167	1:55	65
60	5	51	9.8	6' 8"	7.0	162	1:56	60
55	5	50	9.9	6' 7"	7.0	159	1:58	55
50	4	45	10.0	6' 6"	7.1	154	1:59	50
45	4	42	10.0	6' 5"	7.1	150	2:01 (2:02)	45
40	3	40	10.1	6' 4"	7.2	146	2:04	40

Figure 2. Extract from Table V, showing its use as a profile chart of the motor fitness performances of a fifteen-year-old boy.

The percentile ranks of the performances charted in Figure 2 are as follows, reading from left to right: 60, 50, 62.5 (or 63), 40, 75, 65, and 43.3 (or 43).

Scoring of Superior and Inferior Performances

Any performance which ranks above the ninety-fifth percentile point or below the fifth percentile point must be scored very cautiously. The performance score shown at either the hundredth or the zero percentile point in any test event was the achievement of a single boy. He may have been, by chance, an extremely unusual individual. For example, the hundredth percentile point for the six-hundred-yard run-walk for twelve-year-old boys (see Table II in the present chapter) shows a performance score of one minute twenty-seven seconds, which is superior to the times shown at the hundredth percentile levels for either thirteen-year-old or fourteen-year-old boys. Similar situations occur at the zero percentile level.

Use of the Percentile Scoring Tables by Students

The percentile scoring tables and profile charts are intended for distribution to individual students, as well as to teachers. Distribution to students would have the purpose of motivating interest and spare-time practice of the events. The tables are available in quantity, upon request by Edmonton public school teachers, from the Physical Education Division office of the Edmonton Public School Board.

Limitations of the Scoring Tables

It is the intention of the writer that the scoring tables should be used to diagnose strengths and weaknesses in the physical fitness of

boys, and to motivate the boys and their teachers to remedy the weaknesses. For these reasons the tables should be used as profile charts. However, teachers may desire to combine each boy's individual test item scores in a single score. It is necessary to recognize the limitations of this procedure.

Garrett (12:313-5) shows that it is unsound statistically to average a child's percentile rankings on several test items, unless these rankings lie between the twenty-fifth and seventy-fifth percentile points. The reason is that equal percentages of population cannot be taken to represent equal increments of achievement. The point can be illustrated by reference to Table V in the present chapter. In the softball throw column, the achievement increments may be grouped as follows:

Percentile rank interval	Performance increment	Percentile rank interval	Performance increment
0 to 5th	31 feet	55th to 65th	8 feet
5th to 15th	18 feet	65th to 75th	8 feet
15th to 25th	10 feet	75th to 85th	11 feet
25th to 35th	8 feet	85th to 95th	15 feet
35th to 45th	9 feet	95th to 100th	51 feet
45th to 55th	9 feet		

It will be noted that equal percentages of population represent nearly equal distance increments between the twenty-fifth and seventy-fifth percentile points, but that the distance increments increase rapidly beyond these points.

Garrett indicates that a single expression of percentile ranking

may be obtained, either by taking the median of the several rankings or by averaging them (12:315), only if the conditions outlined in the previous paragraph are satisfied. Error will remain, but it will be minimal.

A further limitation of the scoring tables should be noted. The norms do not necessarily represent desirable levels or standards of performance. They merely present the existing levels of performance at the time of testing. It is quite possible that increased or redirected physical activity could improve the performance of many boys, so that the 1959 norms might no longer apply. It is possible that the median performance scores should be regarded merely as desirable minimums. Such was the view of Dr. Paul Hunsicker, director of the AAHPER test project, with regard to the American national norms determined in 1958.

II. SCORING TABLES AND PROFILE CHARTS BASED ON AGE

The following seven tables are constructed for use in both junior and senior high schools. In order to use them, boys should be classified according to their ages, in years only, taken at the last birthday.

TABLE I

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 11

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	8	100	9.3	6' 9"	6.5	160	1:57	100
95	5	100	10.0	6' 1"	7.2	137	2:06	95
90	4	91	10.2	5'10"	7.4	128	2:12	90
85	3	72	10.4	5' 8"	7.5	125	2:14	85
80	3	63	10.4	5' 7"	7.6	119	2:19	80
75	2	55	10.5	5' 6"	7.7	114	2:20	75
70	2	50	10.5	5' 5"	7.8	112	2:22	70
65	1	43	10.7	5' 4"	7.9	109	2:24	65
60	1	40	10.8	5' 3"	8.0	107	2:26	60
55	1	36	11.0	5' 2"	8.1	104	2:28	55
50	1	32	11.0	5' 1"	8.2	102	2:30	50
45	1	31	11.1	5' 0"	8.2	98	2:34	45
40	0	27	11.2	4'11"	8.4	97	2:37	40
35	0	24	11.4	4'10"	8.4	94	2:40	35
30	0	23	11.6	4'10"	8.5	91	2:43	30
25	0	20	11.7	4' 8"	8.7	89	2:47	25
20	0	18	11.9	4' 7"	8.9	87	2:53	20
15	0	16	12.1	4' 5"	9.0	82	2:58	15
10	0	11	12.5	4' 4"	9.2	76	3:07	10
5	0	9	12.9	4' 0"	9.5	66	3:20	5
0	0	0	15.3	3' 3"	11.2	44	5:00	0

TABLE II

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 12

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	11	100	8.4	7' 4"	5.8	180	1:27	100
95	6	100	9.9	6' 4"	7.0	148	2:02	95
90	5	100	10.0	6' 1"	7.2	138	2:07	90
85	4	81	10.2	5'11"	7.3	132	2:10	85
80	3	65	10.3	5'10"	7.4	129	2:13	80
75	3	58	10.4	5' 9"	7.5	125	2:16	75
70	2	52	10.5	5' 7"	7.6	120	2:18	70
65	2	50	10.6	5' 6"	7.7	118	2:20	65
60	1	43	10.8	5' 5"	7.8	115	2:22	60
55	1	40	10.9	5' 4"	7.9	112	2:23	55
50	1	36	11.0	5' 3"	8.0	109	2:26	50
45	1	33	11.0	5' 2"	8.0	106	2:28	45
40	0	30	11.1	5' 1"	8.1	103	2:30	40
35	0	26	11.2	5' 0"	8.2	101	2:33	35
30	0	25	11.4	5' 0"	8.3	98	2:36	30
25	0	22	11.6	4'10"	8.5	95	2:39	25
20	0	20	11.8	4' 9"	8.6	91	2:42	20
15	0	17	12.0	4' 7"	8.7	87	2:48	15
10	0	14	12.3	4' 6"	9.0	82	2:56	10
5	0	10	12.8	4' 3"	9.2	75	3:10	5
0	0	0	16.0	2'10"	11.9	41	5:07	0

TABLE III

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 13

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	9	100	7.6	8' 2"	6.0	200	1:36	100
95	7	100	9.6	6'10"	6.8	161	1:56	95
90	5	100	9.8	6' 6"	7.0	153	2:02	90
85	5	100	9.9	6' 4"	7.2	147	2:05	85
80	4	81	10.0	6' 2"	7.2	141	2:08	80
75	3	70	10.1	6' 1"	7.4	137	2:11	75
70	3	61	10.2	6' 0"	7.4	133	2:13	70
65	3	56	10.3	5'10"	7.5	131	2:15	65
60	2	50	10.4	5' 9"	7.6	127	2:16	60
55	2	49	10.5	5' 8"	7.7	125	2:18	55
50	1	42	10.6	5' 7"	7.8	121	2:21	50
45	1	40	10.7	5' 6"	7.9	118	2:24	45
40	1	35	10.8	5' 5"	8.0	115	2:26	40
35	0	33	11.0	5' 3"	8.0	113	2:29	35
30	0	30	11.1	5' 2"	8.1	110	2:32	30
25	0	27	11.2	5' 1"	8.2	107	2:35	25
20	0	25	11.4	4'11"	8.4	102	2:39	20
15	0	20	11.6	4' 9"	8.5	97	2:44	15
10	0	18	12.0	4' 8"	8.7	92	2:53	10
5	0	11	12.5	4' 5"	9.1	82	3:08	5
0	0	0	16.2	2' 8"	13.0	47	4:30	0

TABLE IV

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 14

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	14	100	8.6	8' 7"	5.9	238	1:36	100
95	9	100	9.3	7' 4"	6.5	187	1:48	95
90	7	100	9.5	7' 1"	6.7	175	1:52	90
85	6	100	9.6	6'10"	6.8	169	1:55	85
80	6	100	9.7	6' 9"	7.0	162	1:58	80
75	5	81	9.8	6' 7"	7.0	157	2:00	75
70	4	70	10.0	6' 5"	7.1	153	2:02	70
65	4	60	10.0	6' 4"	7.2	149	2:04	65
60	3	55	10.1	6' 3"	7.2	144	2:06	60
55	3	50	10.2	6' 2"	7.3	140	2:08	55
50	3	50	10.2	6' 1"	7.4	136	2:10	50
45	2	44	10.3	5'11"	7.5	133	2:13	45
40	2	40	10.4	5'10"	7.5	129	2:15	40
35	1	38	10.5	5' 9"	7.6	127	2:17	35
30	1	33	10.7	5' 8"	7.8	123	2:19	30
25	1	30	10.9	5' 6"	7.9	119	2:22	25
20	0	29	11.0	5' 4"	8.0	115	2:26	20
15	0	25	11.1	5' 3"	8.1	110	2:30	15
10	0	22	11.4	5' 0"	8.3	103	2:37	10
5	0	19	11.9	4' 8"	8.7	94	2:48	5
0	0	0	16.0	3' 6"	15.0	63	4:17	0

TABLE V

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 15

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DAHS	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	16	100	8.3	9' 7"	5.9	273	1:24	100
95	10	100	9.2	7' 8"	6.4	201	1:42	95
90	9	100	9.3	7' 5"	6.5	194	1:45	90
85	8	100	9.4	7' 4"	6.6	186	1:47	85
80	7	80	9.5	7' 2"	6.7	180	1:49	80
75	6	69	9.6	7' 0"	6.8	175	1:51	75
70	6	61	9.7	6'11"	6.9	172	1:53	70
65	5	57	9.8	6'10"	6.9	167	1:55	65
60	5	51	9.8	6' 8"	7.0	162	1:56	60
55	5	50	9.9	6' 7"	7.0	159	1:58	55
50	4	45	10.0	6' 6"	7.1	154	1:59	50
45	4	42	10.0	6' 5"	7.1	150	2:01	45
40	3	40	10.1	6' 4"	7.2	146	2:04	40
35	3	35	10.2	6' 2"	7.3	141	2:06	35
30	2	33	10.3	6' 1"	7.4	137	2:08	30
25	2	31	10.4	6' 0"	7.5	133	2:11	25
20	2	29	10.5	5'10"	7.5	130	2:14	20
15	1	26	10.7	5' 8"	7.7	123	2:18	15
10	0	22	11.0	5' 6"	7.9	115	2:25	10
5	0	19	11.3	5' 3"	8.2	105	2:36	5
0	0	0	15.9	3' 8"	11.0	61	3:40	0

TABLE VI

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCROING TABLES AND PROFILE CHART FOR BOYS AGED 16

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	18	100	8.4	9'10"	5.4	294	1:21	100
95	11	100	9.2	8' 0"	6.2	215	1:33	95
90	10	100	9.3	7'10"	6.4	204	1:38	90
85	9	100	9.4	7' 8"	6.5	195	1:41	85
80	8	82	9.5	7' 5"	6.6	190	1:44	80
75	7	73	9.5	7' 4"	6.6	185	1:45	75
70	7	63	9.6	7' 3"	6.7	180	1:47	70
65	6	60	9.7	7' 1"	6.7	175	1:48	65
60	6	54	9.7	7' 0"	6.8	170	1:50	60
55	5	50	9.8	6'11"	6.8	167	1:52	55
50	5	47	9.9	6'10"	6.9	165	1:54	50
45	5	43	10.0	6' 9"	7.0	162	1:56	45
40	4	40	10.0	6' 8"	7.0	158	1:58	40
35	4	40	10.1	6' 7"	7.1	155	2:00	35
30	3	36	10.1	6' 5"	7.1	151	2:04	30
25	3	34	10.2	6' 4"	7.2	148	2:06	25
20	3	31	10.3	6' 2"	7.3	141	2:08	20
15	2	30	10.4	6' 0"	7.4	137	2:12	15
10	1	25	10.6	5' 9"	7.6	133	2:17	10
5	0	20	11.0	5' 6"	7.8	123	2:25	5
0	0	2	13.8	4' 4"	8.6	84	4:00	0

TABLE VII

Edmonton Public Junior and Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS AGED 17

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	15	100	8.9	9' 2"	5.7	255	1:20	100
95	12	100	9.1	8' 0"	6.1	222	1:31	95
90	10	100	9.3	7' 9"	6.3	210	1:38	90
85	10	93	9.3	7' 7"	6.4	199	1:41	85
80	9	76	9.4	7' 6"	6.5	195	1:43	80
75	8	63	9.5	7' 5"	6.5	190	1:44	75
70	8	60	9.5	7' 3"	6.6	186	1:46	70
65	7	53	9.6	7' 2"	6.6	180	1:49	65
60	7	51	9.6	7' 2"	6.7	177	1:50	60
55	6	50	9.7	7' 0"	6.7	174	1:51	55
50	6	50	9.8	6'11"	6.8	172	1:54	50
45	6	45	9.8	6'11"	6.8	166	1:55	45
40	5	41	9.9	6'10"	6.9	165	1:58	40
35	5	37	9.9	6' 9"	7.0	162	2:00	35
30	4	35	10.0	6' 8"	7.0	157	2:01	30
25	4	35	10.0	6' 7"	7.0	154	2:04	25
20	3	31	10.1	6' 5"	7.1	147	2:09	20
15	3	30	10.2	6' 2"	7.2	141	2:14	15
10	2	25	10.4	6' 0"	7.4	135	2:20	10
5	1	18	10.7	5' 9"	7.5	128	2:24	5
0	0	10	11.8	5' 2"	10.4	105	3:19	0

III. SCORING TABLES AND PROFILE CHARTS BASED ON McCLOY'S FORMULA NO. 1

McCloy's Classification Formula No. 1 as Used in Edmonton Public Schools

The basic formula is 20(Age) + 6(Height) + (Weight). McCloy's original method (23:119) used age in years to the last complete half year, height in inches to the last complete inch, and weight in pounds to the last complete pound. The Edmonton Public Schools method is given below. Heights are taken in bare feet and weights in minimum clothing.

Age exponent. Age is taken in years and months, to the nearest month. In the incomplete month, sixteen or more days are taken as a whole month, while fifteen or fewer days are discarded. Whole years are multiplied by twenty. Extra months are multiplied by twenty and divided by twelve, the result being rounded to a whole number. The age exponent is the sum of the product for the whole years and the quotient for the extra months. The maximum age exponent used is 340.

Height exponent. Height in inches, to the nearest half inch, is multiplied by six to give the height exponent. An exact quarter inch is taken to the half inch above it, while an exact three quarters of an inch is taken to the full inch above it.

Weight exponent. Weight in pounds, to the nearest pound, is the weight exponent. An exact half pound is taken to the full pound above it.

McCloy number. The McCloy number is the sum of the three exponents.

Scoring Tables and Profile Charts for McCloy Numbers in Intervals of Thirty

The following nine tables are constructed for use in junior high schools only. The McCloy number intervals are indicated in the tables.

TABLE VIII

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "1" (McCLOY NUMBERS 664 AND UNDER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	14	100	9.5	6' 8"	6.6	160	1:27	100
95	7	100	9.9	6' 0"	7.2	130	2:04	95
90	5	100	10.0	5'10"	7.4	122	2:09	90
85	4	91	10.2	5' 8"	7.5	115	2:11	85
80	4	70	10.4	5' 7"	7.6	111	2:14	80
75	3	57	10.4	5' 6"	7.7	110	2:16	75
70	3	52	10.6	5' 5"	7.8	107	2:19	70
65	3	50	10.7	5' 4"	7.9	104	2:20	65
60	2	42	10.8	5' 3"	8.0	102	2:23	60
55	2	40	10.9	5' 2"	8.0	100	2:25	55
50	2	37	11.0	5' 1"	8.1	97	2:27	50
45	1	35	11.0	5' 0"	8.2	96	2:28	45
40	1	29	11.2	4'11"	8.3	93	2:30	40
35	1	27	11.2	4'10"	8.4	91	2:32	35
30	1	24	11.5	4'10"	8.5	90	2:34	30
25	0	22	11.6	4' 8"	8.6	87	2:37	25
20	0	20	11.8	4' 8"	8.7	84	2:39	20
15	0	18	12.0	4' 6"	8.9	81	2:45	15
10	0	12	12.2	4' 5"	9.0	77	2:54	10
5	0	6	13.0	4' 3"	9.5	67	3:10	5
0	0	0	16.0	2'10"	11.0	47	4:09	0

TABLE IX

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "2" (McCLOY NUMBERS 665-694 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	15	100	8.4	7' 0"	6.4	160	1:46	100
95	7	100	9.9	6' 3"	7.0	138	2:04	95
90	5	100	10.0	6' 1"	7.2	132	2:08	90
85	4	80	10.2	5'11"	7.4	127	2:12	85
80	4	70	10.3	5' 9"	7.5	123	2:14	80
75	3	60	10.4	5' 8"	7.6	119	2:16	75
70	3	54	10.5	5' 7"	7.7	116	2:17	70
65	2	50	10.6	5' 6"	7.8	114	2:19	65
60	2	43	10.7	5' 5"	7.9	111	2:21	60
55	2	40	10.8	5' 4"	8.0	108	2:23	55
50	1	38	10.9	5' 3"	8.0	105	2:26	50
45	1	32	11.0	5' 3"	8.0	103	2:28	45
40	1	30	11.1	5' 2"	8.1	101	2:30	40
35	1	26	11.2	5' 1"	8.2	99	2:33	35
30	0	25	11.4	5' 0"	8.3	95	2:36	30
25	0	22	11.5	4'11"	8.4	92	2:39	25
20	0	19	11.7	4'10"	8.5	89	2:41	20
15	0	15	12.0	4' 9"	8.7	85	2:47	15
10	0	12	12.4	4' 6"	8.9	79	2:52	10
5	0	8	12.8	4' 4"	9.2	71	3:02	5
0	0	0	15.9	3' 4"	11.2	42	3:57	0

TABLE X

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "3" (McCLOY NUMBERS 695-724 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	8.4	7' 4"	6.4	190	1:29	100
95	5	100	9.7	6' 5"	7.0	150	2:02	95
90	4	100	9.9	6' 3"	7.2	140	2:07	90
85	4	100	10.0	6' 1"	7.3	135	2:09	85
80	3	75	10.2	5'11"	7.4	131	2:12	80
75	3	65	10.3	5'10"	7.5	128	2:13	75
70	2	55	10.4	5' 8"	7.6	125	2:16	70
65	2	50	10.5	5' 7"	7.7	120	2:18	65
60	1	50	10.6	5' 6"	7.8	118	2:20	60
55	1	45	10.7	5' 5"	7.9	115	2:23	55
50	1	40	10.8	5' 4"	8.0	113	2:25	50
45	1	38	10.9	5' 3"	8.0	110	2:27	45
40	0	34	11.0	5' 2"	8.1	108	2:30	40
35	0	31	11.1	5' 1"	8.2	105	2:32	35
30	0	27	11.2	5' 0"	8.3	102	2:35	30
25	0	24	11.4	4'11"	8.4	99	2:39	25
20	0	21	11.7	4' 9"	8.5	95	2:43	20
15	0	18	11.9	4' 8"	8.7	91	2:48	15
10	0	15	12.2	4' 6"	8.9	87	2:58	10
5	0	10	12.7	4' 4"	9.1	77	3:10	5
0	0	1	15.5	3' 6"	11.7	49	5:00	0

TABLE XI

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "4" (McCLOY NUMBERS 725-754 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	7.6	7' 8"	6.0	213	1:40	100
95	7	100	9.7	6' 9"	6.9	157	1:58	95
90	6	100	9.9	6' 4"	7.1	149	2:03	90
85	5	100	10.0	6' 3"	7.2	142	2:06	85
80	4	100	10.1	6' 1"	7.3	137	2:09	80
75	3	72	10.2	6' 0"	7.4	133	2:11	75
70	3	60	10.3	5'10"	7.5	130	2:14	70
65	2	57	10.4	5' 9"	7.6	128	2:16	65
60	2	50	10.5	5' 8"	7.6	125	2:18	60
55	1	50	10.6	5' 7"	7.7	121	2:20	55
50	1	40	10.8	5' 6"	7.8	119	2:22	50
45	1	36	10.9	5' 5"	7.9	116	2:24	45
40	0	35	11.0	5' 4"	8.0	115	2:26	40
35	0	31	11.1	5' 3"	8.0	111	2:29	35
30	0	29	11.2	5' 2"	8.1	107	2:32	30
25	0	25	11.4	5' 0"	8.3	104	2:35	25
20	0	23	11.5	4'11"	8.4	99	2:39	20
15	0	20	11.7	4' 9"	8.5	94	2:46	15
10	0	16	12.0	4' 7"	8.7	89	2:56	10
5	0	11	12.5	4' 4"	9.2	81	3:11	5
0	0	0	16.0	3' 6"	10.6	51	4:30	0

TABLE XII

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "5" (McCLOY NUMBERS 755-784 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	12	100	8.6	7' 7"	6.0	200	1:42	100
95	8	100	9.4	6'10"	6.9	163	1:55	95
90	6	100	9.7	6' 7"	7.0	155	1:59	90
85	5	100	9.9	6' 5"	7.2	150	2:02	85
80	4	82	10.0	6' 4"	7.2	146	2:05	80
75	4	70	10.0	6' 2"	7.3	141	2:08	75
70	3	60	10.2	6' 1"	7.4	137	2:11	70
65	2	56	10.2	6' 0"	7.5	135	2:14	65
60	2	50	10.3	5'10"	7.5	132	2:15	60
55	2	49	10.5	5' 9"	7.6	129	2:17	55
50	1	43	10.5	5' 8"	7.7	127	2:19	50
45	1	38	10.7	5' 7"	7.8	123	2:22	45
40	1	34	10.8	5' 6"	7.9	119	2:25	40
35	0	31	11.0	5' 5"	8.0	116	2:28	35
30	0	29	11.0	5' 3"	8.0	113	2:30	30
25	0	25	11.2	5' 2"	8.2	110	2:34	25
20	0	25	11.4	5' 0"	8.4	105	2:39	20
15	0	21	11.6	4'10"	8.5	101	2:45	15
10	0	19	12.0	4' 8"	9.0	95	2:53	10
5	0	13	12.7	4' 3"	9.3	84	3:10	5
0	0	0	16.2	2' 8"	11.9	41	5:07	0

TABLE XIII

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "6" (McCLOY NUMBERS 785-814 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	8.9	8' 2"	6.0	218	1:36	100
95	9	100	9.4	7' 3"	6.6	179	1:51	95
90	7	100	9.5	7' 0"	6.8	170	1:56	90
85	6	100	9.7	6' 9"	6.9	163	1:59	85
80	5	100	9.8	6' 8"	7.0	157	2:01	80
75	5	83	9.9	6' 6"	7.0	151	2:03	75
70	4	71	10.0	6' 5"	7.1	149	2:05	70
65	4	60	10.1	6' 4"	7.2	146	2:08	65
60	3	52	10.2	6' 2"	7.2	142	2:10	60
55	3	50	10.2	6' 1"	7.4	139	2:13	55
50	2	45	10.3	6' 0"	7.4	134	2:15	50
45	2	41	10.4	5'11"	7.5	132	2:17	45
40	2	39	10.5	5'10"	7.6	130	2:19	40
35	1	35	10.7	5' 9"	7.7	126	2:22	35
30	1	31	10.8	5' 8"	7.8	122	2:25	30
25	0	30	11.0	5' 6"	7.9	119	2:27	25
20	0	27	11.1	5' 4"	8.0	115	2:32	20
15	0	25	11.2	5' 1"	8.1	110	2:38	15
10	0	22	11.5	4'10"	8.3	103	2:45	10
5	0	18	12.1	4' 6"	8.8	97	3:00	5
0	0	1	16.0	3' 6"	10.5	51	5:00	0

TABLE XIV

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "7" (McCLOY NUMBERS 815-844 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	16	100	8.4	8' 2"	6.0	224	1:37	100
95	10	100	9.2	7' 6"	6.3	191	1:48	95
90	8	100	9.3	7' 3"	6.6	177	1:53	90
85	6	100	9.5	7' 1"	6.7	172	1:55	85
80	5	100	9.6	7' 0"	6.8	168	1:58	80
75	5	86	9.7	6' 9"	6.9	163	2:01	75
70	5	70	9.8	6' 7"	7.0	159	2:03	70
65	4	64	9.9	6' 6"	7.0	156	2:05	65
60	4	60	10.0	6' 5"	7.1	152	2:07	60
55	3	52	10.1	6' 4"	7.2	148	2:09	55
50	3	50	10.2	6' 3"	7.2	143	2:11	50
45	3	47	10.2	6' 1"	7.3	139	2:13	45
40	2	40	10.4	6' 0"	7.4	134	2:15	40
35	2	37	10.5	5'10"	7.5	131	2:17	35
30	1	35	10.6	5' 9"	7.6	127	2:20	30
25	1	32	10.8	5' 7"	7.8	124	2:25	25
20	0	30	11.0	5' 5"	8.0	121	2:28	20
15	0	24	11.2	5' 3"	8.1	113	2:37	15
10	0	20	11.6	5' 1"	8.3	107	2:46	10
5	0	13	12.6	4' 8"	8.7	95	3:02	5
0	0	0	15.6	3' 6"	11.8	63	4:12	0

TABLE XV

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "8" (McCLOY NUMBERS 845-874 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	12	100	8.5	8' 0"	5.9	228	1:36	100
95	10	100	9.0	7' 8"	6.3	197	1:47	95
90	8	100	9.2	7' 5"	6.4	186	1:51	90
85	8	100	9.4	7' 4"	6.5	179	1:54	85
80	6	100	9.6	7' 2"	6.6	176	1:55	80
75	6	85	9.7	7' 0"	6.7	173	1:57	75
70	5	67	9.8	6'11"	6.8	168	1:58	70
65	5	62	9.8	6'10"	6.9	165	1:59	65
60	4	56	9.9	6' 9"	7.0	163	2:00	60
55	4	50	10.0	6' 8"	7.0	158	2:03	55
50	3	47	10.1	6' 7"	7.0	155	2:06	50
45	3	41	10.2	6' 5"	7.1	149	2:08	45
40	2	40	10.3	6' 4"	7.2	145	2:09	40
35	2	35	10.4	6' 2"	7.2	140	2:12	35
30	2	29	10.5	6' 0"	7.4	138	2:13	30
25	1	28	10.8	5' 9"	7.5	134	2:15	25
20	1	27	10.9	5' 8"	7.8	129	2:20	20
15	1	24	11.0	5' 6"	8.0	122	2:25	15
10	0	20	11.6	5' 4"	8.2	112	2:37	10
5	0	15	12.1	4'10"	8.7	100	3:03	5
0	0	4	15.5	3' 6"	11.8	91	4:17	0

TABLE XVI

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN CLASS "9" (McCLOY NUMBERS 875 AND OVER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	8.8	9' 2"	5.4	230	1:35	100
95	9	100	9.1	7' 8"	6.2	207	1:47	95
90	8	100	9.4	7' 7"	6.5	196	1:49	90
85	8	80	9.4	7' 5"	6.5	187	1:53	85
80	6	75	9.5	7' 2"	6.6	182	1:56	80
75	6	65	9.6	7' 1"	6.7	179	1:58	75
70	5	61	9.6	7' 0"	6.8	175	2:00	70
65	4	54	9.7	6'11"	6.8	172	2:01	65
60	4	50	9.8	6' 9"	6.9	164	2:04	60
55	3	50	10.0	6' 8"	7.0	162	2:05	55
50	3	44	10.0	6' 7"	7.0	156	2:07	50
45	3	40	10.1	6' 6"	7.1	152	2:11	45
40	2	37	10.2	6' 4"	7.2	151	2:13	40
35	2	34	10.2	6' 3"	7.2	141	2:18	35
30	1	30	10.5	6' 1"	7.4	138	2:22	30
25	1	30	10.6	5'10"	7.5	135	2:26	25
20	0	26	10.9	5' 8"	7.6	133	2:31	20
15	0	23	11.0	5' 7"	7.9	121	2:38	15
10	0	19	11.1	5' 5"	8.0	117	2:50	10
5	0	14	11.5	5' 0"	8.4	100	3:28	5
0	0	9	15.2	4' 0"	10.4	80	3:51	0

Scoring Tables and Profile Charts for McCloy Numbers in Intervals of Sixty

The following five tables are constructed for use in junior high schools only. The McCloy number intervals are indicated in the tables. The tables entitled "Junior A" and "Junior B" together span approximately the same range as the "Junior" division used in the Edmonton Public Schools junior high school track and field meets. Similarly, the table entitled "Intermediate" spans approximately the same range as the "Intermediate" division used in these track meets, while the tables entitled "Senior A" and "Senior B" together span exactly the same range as the "Senior" division used in these track meets.

TABLE XVII

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "JUNIOR 'A'" CLASS (McCLOY NUMBERS 694 AND UNDER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	15	100	8.4	7' 0"	6.4	160	1:27	100
95	7	100	9.9	6' 2"	7.1	136	2:04	95
90	5	100	10.0	6' 0"	7.3	130	2:08	90
85	4	80	10.2	5'10"	7.4	125	2:12	85
80	4	70	10.3	5' 9"	7.5	120	2:14	80
75	3	60	10.4	5' 7"	7.6	116	2:16	75
70	3	54	10.5	5' 6"	7.7	113	2:18	70
65	3	50	10.6	5' 5"	7.8	110	2:20	65
60	2	45	10.7	5' 4"	7.9	108	2:22	60
55	2	40	10.8	5' 4"	8.0	105	2:23	55
50	1	38	11.0	5' 3"	8.0	103	2:26	50
45	1	33	11.0	5' 2"	8.1	100	2:28	45
40	1	30	11.1	5' 1"	8.2	98	2:30	40
35	1	26	11.2	5' 0"	8.3	96	2:33	35
30	0	25	11.4	4'11"	8.4	92	2:36	30
25	0	22	11.6	4'10"	8.5	90	2:38	25
20	0	20	11.8	4' 9"	8.6	87	2:41	20
15	0	17	12.0	4' 8"	8.7	83	2:46	15
10	0	12	12.4	4' 6"	9.0	79	2:53	10
5	0	8	12.9	4' 3"	9.2	71	3:02	5
0	0	0	16.0	2'10"	11.2	42	4:09	0

TABLE XVIII

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "JUNIOR 'B'" CLASS (McCLOY NUMBERS 695-754 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	7.6	7' 8"	6.0	213	1:29	100
95	6	100	9.7	6' 6"	7.0	153	2:00	95
90	5	100	9.9	6' 4"	7.1	145	2:05	90
85	4	100	10.0	6' 2"	7.2	138	2:08	85
80	3	80	10.1	6' 0"	7.4	134	2:10	80
75	3	68	10.2	5'11"	7.5	131	2:13	75
70	2	60	10.4	5' 9"	7.5	128	2:15	70
65	2	53	10.5	5' 8"	7.6	125	2:17	65
60	1	50	10.5	5' 7"	7.7	120	2:19	60
55	1	46	10.7	5' 6"	7.8	118	2:21	55
50	1	40	10.8	5' 5"	7.9	116	2:24	50
45	1	37	10.9	5' 4"	8.0	113	2:25	45
40	0	34	11.0	5' 3"	8.0	110	2:28	40
35	0	31	11.1	5' 2"	8.1	108	2:30	35
30	0	28	11.2	5' 1"	8.2	105	2:34	30
25	0	25	11.4	5' 0"	8.3	100	2:37	25
20	0	22	11.6	4'10"	8.5	97	2:41	20
15	0	20	11.8	4' 8"	8.6	92	2:47	15
10	0	15	12.0	4' 7"	8.9	88	2:57	10
5	0	10	12.6	4' 4"	9.1	78	3:11	5
0	0	0	16.0	3' 6"	11.7	49	5:00	0

TABLE XIX

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "INTERMEDIATE" CLASS (McCLOY NUMBERS 755-814 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	8.6	8' 2"	6.0	218	1:36	100
95	8	100	9.4	7' 1"	6.7	173	1:53	95
90	7	100	9.6	6' 9"	6.9	161	1:58	90
85	5	100	9.8	6' 7"	7.0	156	2:00	85
80	5	100	9.9	6' 6"	7.1	150	2:03	80
75	4	75	10.0	6' 4"	7.2	147	2:05	75
70	4	64	10.1	6' 3"	7.2	143	2:08	70
65	3	57	10.2	6' 2"	7.4	139	2:11	65
60	3	50	10.2	6' 0"	7.4	136	2:14	60
55	2	50	10.3	5'11"	7.5	133	2:15	55
50	2	44	10.4	5'10"	7.6	130	2:17	50
45	1	40	10.6	5' 9"	7.7	127	2:20	45
40	1	35	10.7	5' 8"	7.8	124	2:22	40
35	1	33	10.8	5' 7"	7.9	120	2:25	35
30	0	30	11.0	5' 5"	8.0	116	2:28	30
25	0	28	11.0	5' 3"	8.0	114	2:31	25
20	0	25	11.2	5' 1"	8.2	110	2:36	20
15	0	23	11.5	4'11"	8.4	104	2:42	15
10	0	20	11.8	4' 9"	8.7	99	2:51	10
5	0	15	12.5	4' 4"	9.1	90	3:02	5
0	0	0	16.2	2' 8"	11.9	41	5:07	0

TABLE XX

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "SENIOR 'A'" CLASS (McCLOY NUMBERS 815-874 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	16	100	8.4	8' 2"	5.9	228	1:36	100
95	10	100	9.1	7' 7"	6.3	193	1:47	95
90	8	100	9.3	7' 4"	6.5	181	1:52	90
85	7	100	9.5	7' 2"	6.6	175	1:55	85
80	6	100	9.6	7' 0"	6.8	170	1:56	80
75	5	85	9.7	6'10"	6.8	165	1:59	75
70	5	70	9.8	6' 9"	6.9	163	2:00	70
65	4	64	9.9	6' 8"	7.0	159	2:03	65
60	4	60	10.0	6' 7"	7.0	155	2:05	60
55	3	52	10.0	6' 5"	7.1	151	2:07	55
50	3	50	10.1	6' 4"	7.2	146	2:09	50
45	3	44	10.2	6' 3"	7.2	142	2:11	45
40	2	40	10.3	6' 1"	7.3	138	2:13	40
35	2	37	10.5	6' 0"	7.4	134	2:15	35
30	1	33	10.6	5' 9"	7.5	130	2:18	30
25	1	30	10.8	5' 8"	7.7	126	2:21	25
20	1	26	11.0	5' 6"	7.9	122	2:27	20
15	0	24	11.2	5' 4"	8.0	116	2:34	15
10	0	20	11.6	5' 1"	8.3	109	2:40	10
5	0	15	12.2	4' 8"	8.7	97	3:02	5
0	0	0	15.6	3' 6"	11.8	63	4:17	0

TABLE XXI

Edmonton Public Junior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "SENIOR 'B'" CLASS (McCLOY NUMBERS 875 AND OVER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	13	100	8.8	9' 2"	5.4	230	1:35	100
95	9	100	9.1	7' 8"	6.2	207	1:47	95
90	8	100	9.4	7' 7"	6.5	196	1:49	90
85	8	80	9.4	7' 5"	6.5	187	1:53	85
80	6	75	9.5	7' 2"	6.6	182	1:56	80
75	6	65	9.6	7' 1"	6.7	179	1:58	75
70	5	61	9.6	7' 0"	6.8	175	2:00	70
65	4	54	9.7	6'11"	6.8	172	2:01	65
60	4	50	9.8	6' 9"	6.9	164	2:04	60
55	3	50	10.0	6' 8"	7.0	162	2:05	55
50	3	44	10.0	6' 7"	7.0	156	2:07	50
45	3	40	10.1	6' 6"	7.1	152	2:11	45
40	2	37	10.2	6' 4"	7.2	151	2:13	40
35	2	34	10.2	6' 3"	7.2	141	2:18	35
30	1	30	10.5	6' 1"	7.4	138	2:22	30
25	1	30	10.6	5'10"	7.5	135	2:26	25
20	0	26	10.9	5' 8"	7.6	133	2:31	20
15	0	23	11.0	5' 7"	7.9	121	2:38	15
10	0	19	11.1	5' 5"	8.0	117	2:50	10
5	0	14	11.5	5' 0"	8.4	100	3:28	5
0	0	9	15.2	4' 0"	10.4	80	3:51	0

IV. SCORING TABLES AND PROFILE CHARTS BASED ON THE COZENS-TRIEB-NEILSON CLASSIFICATION FORMULA

The Cozens-Trieb-Neilson Classification Formula (8:13)

The Cozens-Trieb-Neilson classification formula (or California Classification Index) is 2(Age) + .475(Height) + .16(Weight). Age, height, and weight are taken to the nearest month, half inch, and pound, respectively, as detailed for the McCloy formula on page 83. Age is converted to months, instead of years and extra months.

The exponent chart. From the chart below a separate exponent is extracted for each of age, height, and weight. The three are then added.

EXPONENT	AGE (months)	HEIGHT (inches)	WEIGHT (pounds)	EXPONENT
9	- - - - - - - - - - - - - -		53- 59	9
10	- - - - - - - - - - - - - -		60- 65	10
11	- - - - - - - - - - - - - -		66- 71	11
12	- - - - - - - - - - - - - -		72- 78	12
13	- - - - - - - - - - - - - -		79- 84	13
14	- - - - - - - - - - - - - -		85- 90	14
15	- - - - - - - - - - - - - -		91- 96	15
16	- - - - - - - - - - - - - -		97-103	16
17	- - - - - - - - - - - - - -		104-109	17
18	- - - - - - - - - - - - - -		110-115	18
19	- - - - - - - - - - - - - -		116-121	19
20	- - - - - - - - - - - - - -		122-128	20
21	- - - - - - - - - - - - - -		129-134	21
22	129-134	0-47	135-140	22
23	135-140	47.5-49	141-146	23
24	141-146	49.5-51.5	147-153	24
25	147-152	52 -53.5	154-159	25
26	153-158	54 -55.5	160-165	26
27	159-164	56 -57.5	166-171	27
28	165-170	58 -59.5	172-178	28
29	171-176	60 -62	179-184	29
30	177-182	62.5-64	185-190	30
31	183-188	64.5-66	191 and up	31
32	189-194	66.5-68 - - - - - - - - -		32
33	195-200	68.5-70.5 - - - - - - - -		33
34	201-206	71 -72.5 - - - - - - - -		34
35	207-212	73 -74.5 - - - - - - - -		35
36	213-218	75 and up - - - - - - - -		36
37	219-224	- - - - - - - - - - - - - -		37
38	225-230	- - - - - - - - - - - - - -		38

CLASSIFICATION GROUPINGS

SUM OF EXPONENTS	CLASS
88 and up	A
83 - 87	B
82 and down	C

Note: For ages above and below the chart, and for weights below the chart, exponent values should be extrapolated.

Scoring Tables and Profile Charts for the Cozens-Trieb-Neilson Formula

The following three tables are constructed for use in senior high schools only. The Cozens-Trieb-Neilson exponent sum intervals are indicated in the tables.

TABLE XXII

Edmonton Public Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "C" CLASS (COZENS-TRIEB-NEILSON NUMBERS 82 AND UNDER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	16	100	8.3	8' 8"	6.0	225	1:27	100
95	10	100	9.3	7' 5"	6.4	188	1:42	95
90	9	100	9.4	7' 2"	6.6	180	1:46	90
85	8	86	9.5	7' 0"	6.8	173	1:48	85
80	7	75	9.7	6'11"	6.9	168	1:50	80
75	7	65	9.8	6' 9"	6.9	163	1:52	75
70	6	60	9.9	6' 8"	7.0	159	1:54	70
65	6	54	9.9	6' 7"	7.0	155	1:56	65
60	5	50	10.0	6' 6"	7.1	151	1:57	60
55	5	50	10.0	6' 5"	7.2	147	1:59	55
50	4	45	10.0	6' 4"	7.2	143	2:00	50
45	4	41	10.1	6' 3"	7.3	139	2:01	45
40	3	39	10.2	6' 2"	7.4	135	2:04	40
35	3	35	10.3	6' 0"	7.5	133	2:06	35
30	2	33	10.3	6' 0"	7.5	130	2:08	30
25	2	31	10.4	5'10"	7.6	126	2:10	25
20	2	29	10.5	5' 9"	7.7	123	2:12	20
15	1	26	10.7	5' 7"	7.9	117	2:16	15
10	1	23	10.9	5' 5"	8.0	110	2:19	10
5	0	20	11.2	5' 3"	8.3	99	2:30	5
0	0	0	12.4	4' 6"	11.0	61	3:10	0

TABLE XXIII

Edmonton Public Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "B" CLASS (COZENS-TRIEB-NEILSON NUMBERS 83-87 INCLUSIVE)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Per-centiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Per-centiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	18	100	8.4	9' 6"	5.8	237	1:21	100
95	11	100	9.1	7'10"	6.2	206	1:39	95
90	10	100	9.3	7' 8"	6.4	197	1:43	90
85	9	100	9.4	7' 6"	6.5	191	1:45	85
80	8	80	9.5	7' 4"	6.6	183	1:46	80
75	7	70	9.5	7' 3"	6.6	179	1:47	75
70	7	62	9.6	7' 1"	6.7	175	1:49	70
65	6	58	9.7	7' 0"	6.8	171	1:50	65
60	6	53	9.7	6'11"	6.9	168	1:52	60
55	5	50	9.8	6'10"	6.9	164	1:54	55
50	5	45	9.8	6' 9"	7.0	161	1:55	50
45	5	41	10.0	6' 8"	7.0	158	1:56	45
40	4	40	10.0	6' 7"	7.0	154	1:58	40
35	4	36	10.0	6' 6"	7.1	150	2:00	35
30	3	35	10.1	6' 5"	7.2	146	2:02	30
25	3	31	10.2	6' 4"	7.2	141	2:05	25
20	2	30	10.3	6' 2"	7.4	137	2:07	20
15	2	27	10.5	6' 0"	7.4	132	2:11	15
10	1	25	10.6	5'10"	7.5	128	2:15	10
5	1	20	10.9	5' 7"	7.8	120	2:21	5
0	0	0	12.3	4' 4"	10.0	57	3:01	0

TABLE XXIV

Edmonton Public Senior High Schools

PHYSICAL FITNESS SCORING TABLES AND PROFILE CHART FOR BOYS IN "A" CLASS (COZENS-TRIEB-NEILSON NUMBERS 88 AND OVER)

AAHPER Youth Fitness Tests, Edmonton Norms for October 1, 1959

Percentiles	PULL-UP	SIT-UP	SHUTTLE RUN	STANDING BROAD JUMP	50-YARD DASH	SOFTBALL THROW	600-YARD RUN-WALK	Percentiles
	Repetitions	Repetitions	Seconds	Feet, inches	Seconds	Feet	Minutes, seconds	
100	18	100	8.6	9'10"	5.7	294	1:20	100
95	10	100	9.2	8' 1"	6.2	225	1:33	95
90	9	100	9.3	7'10"	6.4	210	1:38	90
85	8	95	9.4	7' 8"	6.5	203	1:40	85
80	7	80	9.4	7' 6"	6.5	195	1:43	80
75	7	65	9.5	7' 4"	6.6	192	1:44	75
70	6	60	9.6	7' 3"	6.7	187	1:46	70
65	6	55	9.7	7' 2"	6.7	183	1:48	65
60	5	51	9.7	7' 1"	6.8	180	1:50	60
55	5	50	9.8	7' 0"	6.8	175	1:51	55
50	4	48	9.9	6'11"	6.9	172	1:53	50
45	4	43	10.0	6'10"	7.0	167	1:56	45
40	4	40	10.0	6' 9"	7.0	164	1:57	40
35	3	40	10.0	6' 7"	7.0	161	1:59	35
30	2	36	10.1	6' 5"	7.1	157	2:02	30
25	2	34	10.2	6' 4"	7.3	152	2:05	25
20	1	32	10.3	6' 1"	7.3	148	2:08	20
15	1	30	10.4	6' 0"	7.4	141	2:14	15
10	0	25	10.7	5' 9"	7.6	134	2:20	10
5	0	20	11.0	5' 5"	8.0	123	2:31	5
0	0	3	13.4	3' 8"	10.0	77	4:00	0

CHAPTER VI

EVALUATIONS AND COMPARISONS

I. EVALUATION OF THE DATA

Suitability of the Percentile Scoring Method

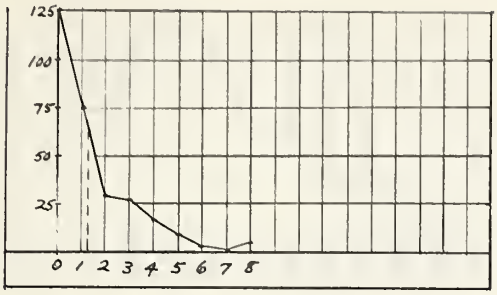
The percentile scoring method used in the present study is only one of several ways of analyzing raw data for use by teachers. In order to evaluate the suitability of the method, frequency polygons were drawn for each test event at each age level. The polygons are shown in Figures 3 to 9, inclusive, on the following pages.

Characteristics of the distributions. Visual examination of the frequency polygons reveals the following characteristics:

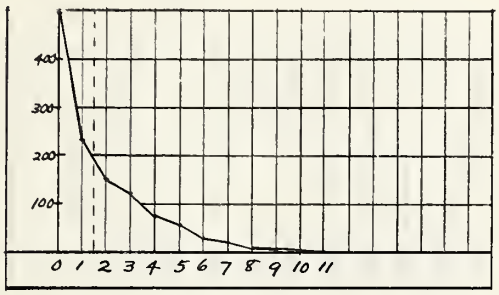
1. Pull-up: distribution positively skewed at all age levels.
2. Sit-up: distributions positively skewed at all age levels. In the writer's opinion, removal of the arbitrary limit of one hundred sit-ups would have accentuated the skewing.
3. Shuttle run: distributions negatively skewed at all age levels.
4. Standing broad jump: data normally distributed.
5. Fifty-yard dash: distributions negatively skewed, the characteristic decreasing with advancing age.
6. Softball throw: data normally distributed, with slight positive skewness at ages fourteen and sixteen.
7. Six-hundred-yard run-walk: distributions negatively skewed.

The work of Ehrlich (10) disagrees in part with the results of the present study. He found positive skewness in distributions for the one-

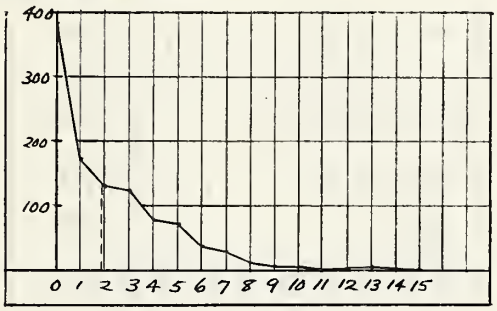
Age 11 years, N = 291
Median = 1.3



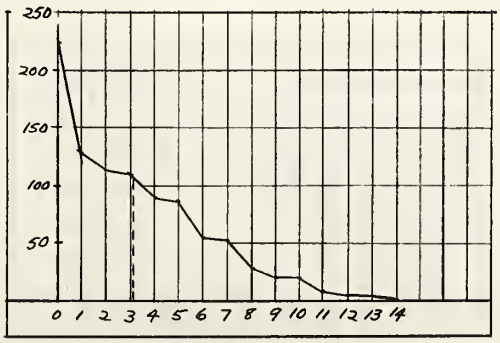
Age 12 years, N = 1189
Median = 1.5



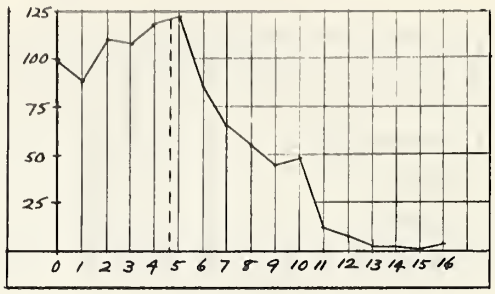
Age 13 years, N = 1061
Median = 1.9



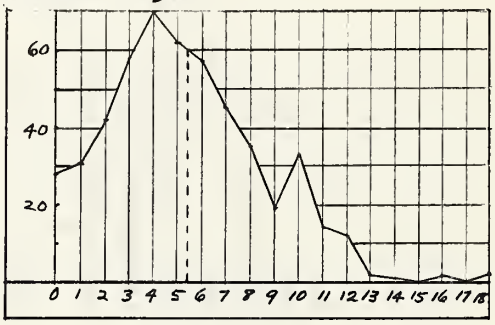
Age 14 years, N = 942
Median = 3.1



Age 15 years, N = 971
Median = 4.7



Age 16 years, N = 513
Median = 5.4



Age 17 years, N = 144
Median = 6.5

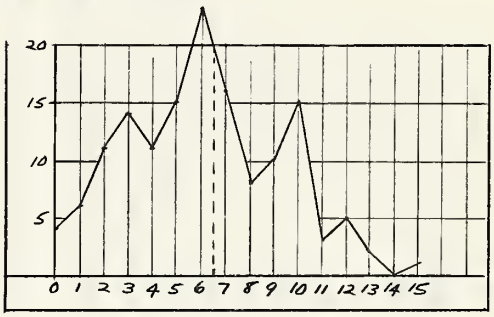
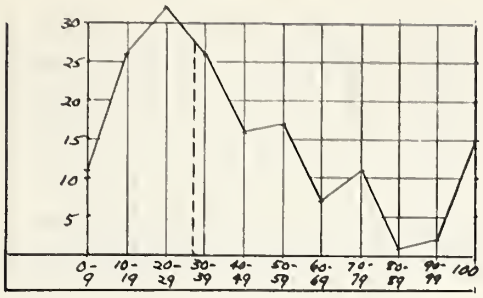


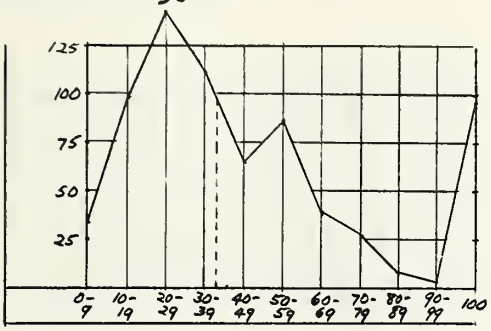
Figure 3. Pull-up performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Repetitions of pull-ups.

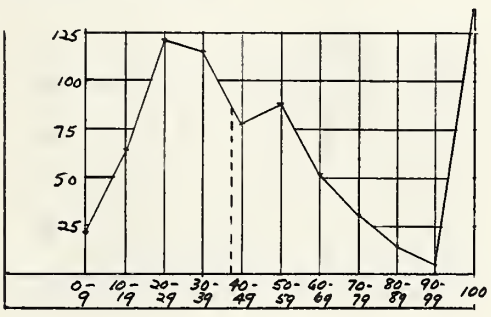
Age 11 years, N = 164
Median = 32



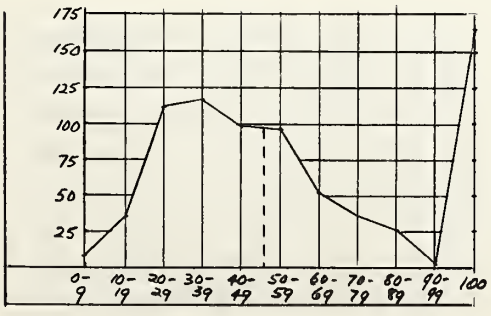
Age 12 years, N = 712
Median = 36



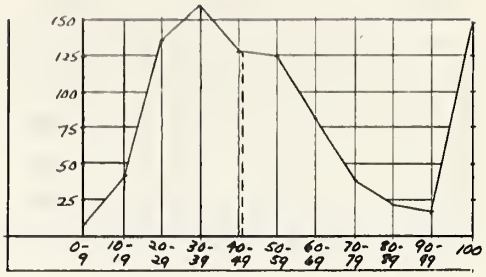
Age 13 years, N = 725
Median = 42



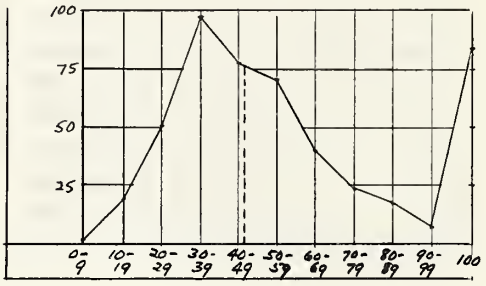
Age 14 years, N = 747
Median = 50



Age 15 years, N = 901
Median = 45



Age 16 years, N = 491
Median = 47



Age 17 years, N = 144
Median = 50

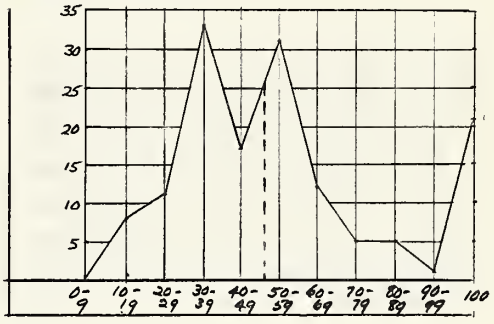
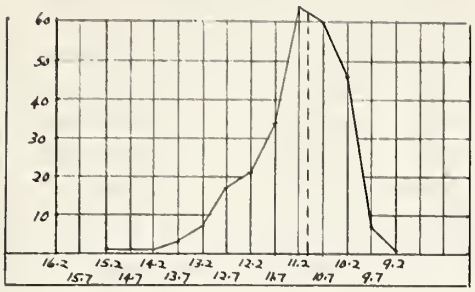


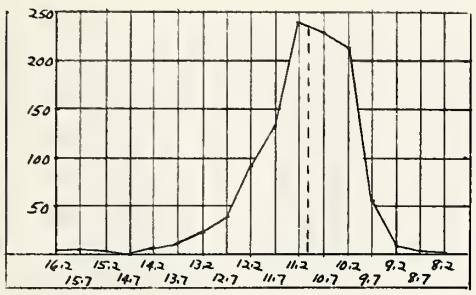
Figure 4. Sit-up performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Repetitions of sit-ups.

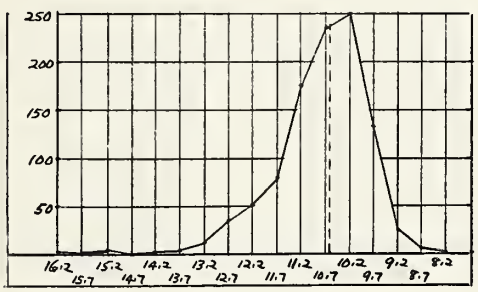
Age 11 years, N = 263
Median = 11.0



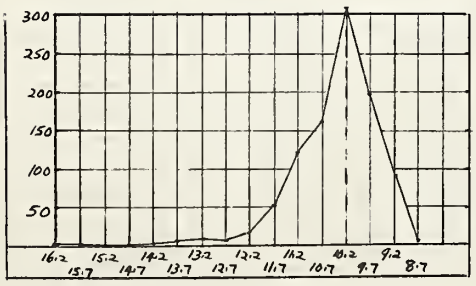
Age 12 years, N = 1066
Median = 11.0



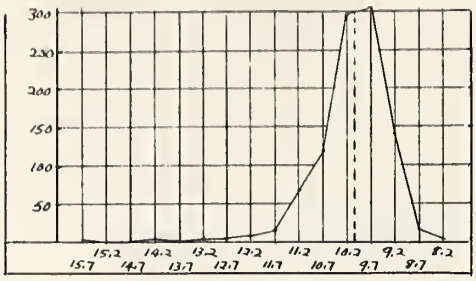
Age 13 years, N = 1000
Median = 10.6



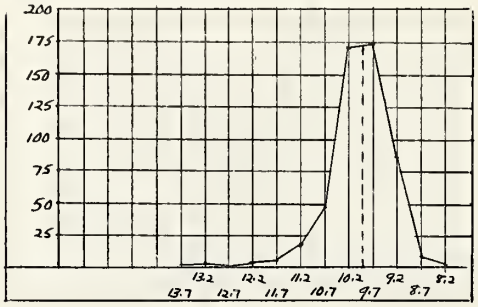
Age 14 years, N = 972
Median = 10.2



Age 15 years, N = 973
Median = 10.0



Age 16 years, N = 510
Median = 9.9



Age 17 years, N = 144
Median = 9.8

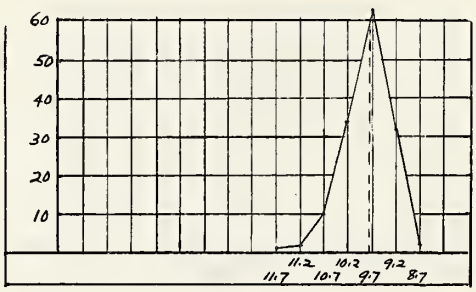
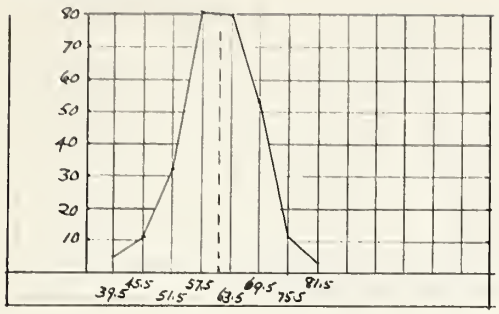


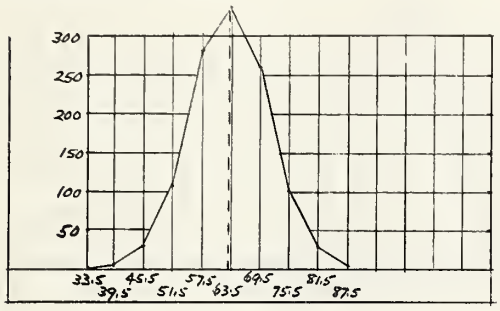
Figure 5. Shuttle run performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Mid-points of intervals, in seconds.

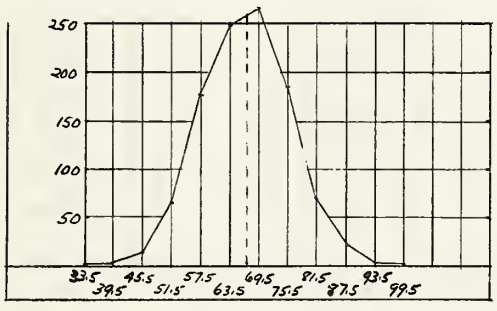
Age 11 years, N = 276
Median = 61



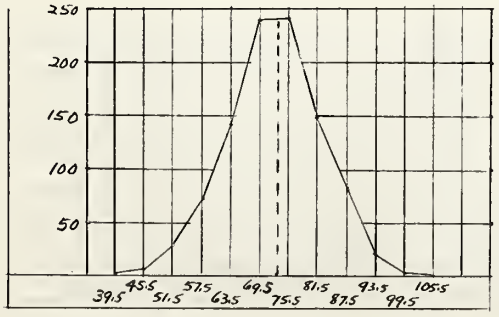
Age 12 years, N = 1161
Median = 63



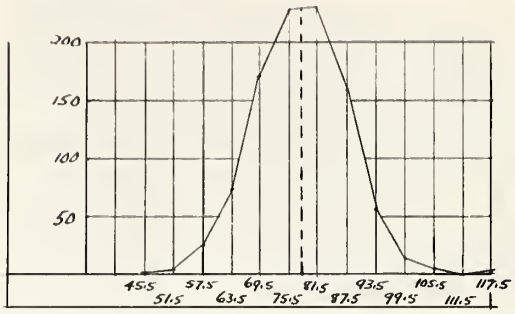
Age 13 years, N = 1057
Median = 67



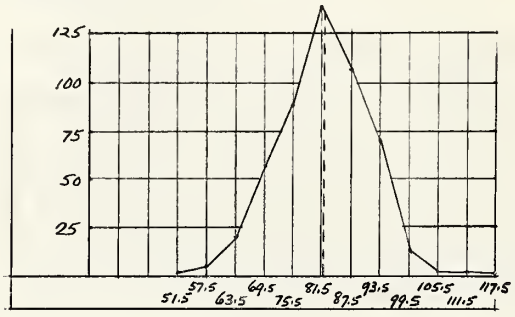
Age 14 years, N = 983
Median = 73



Age 15 years, N = 966
Median = 78



Age 16 years, N = 508
Median = 82



Age 17 years, N = 147
Median = 83

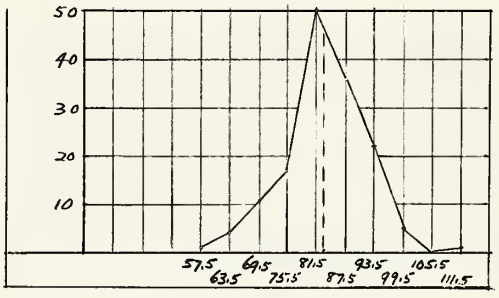
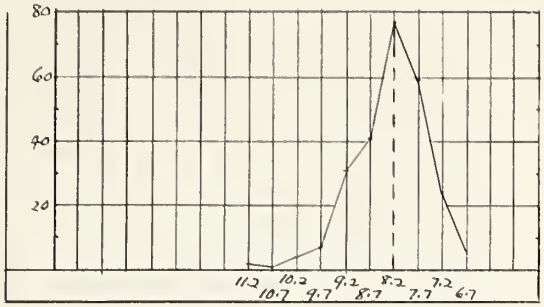


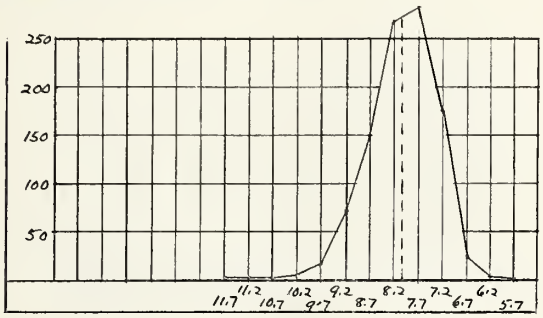
Figure 6. Standing broad jump performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Mid-points of intervals, in inches.

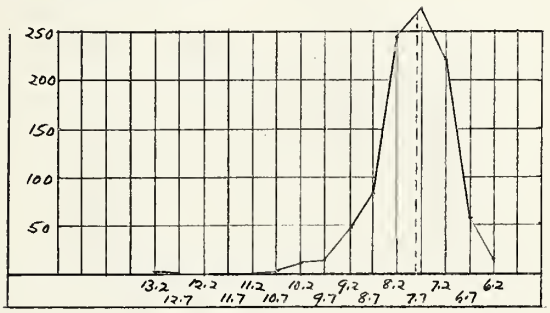
Age 11 years, N = 252
Median = 8.2



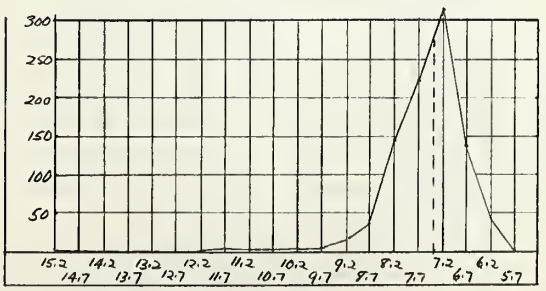
Age 12 years, N = 1007
Median = 8.0



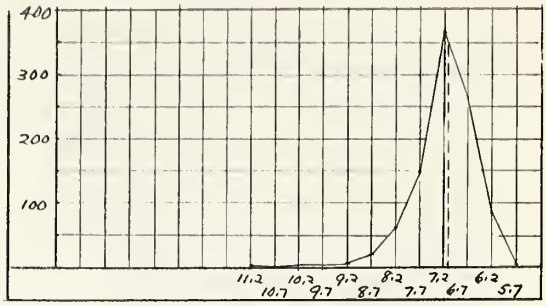
Age 13 years, N = 977
Median = 7.8



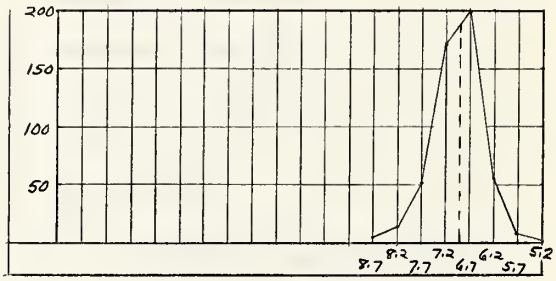
Age 14 years, N = 932
Median = 7.4



Age 15 years, N = 960
Median = 7.1



Age 16 years, N = 505
Median = 6.9



Age 17 years, N = 140
Median = 6.8

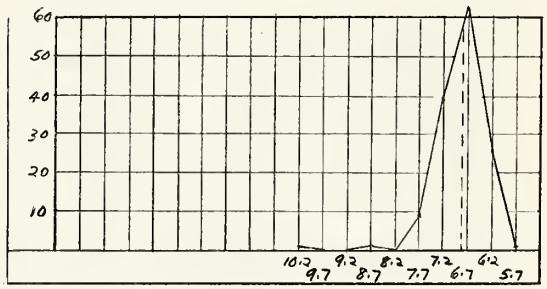
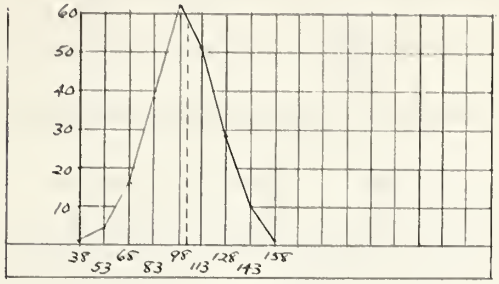


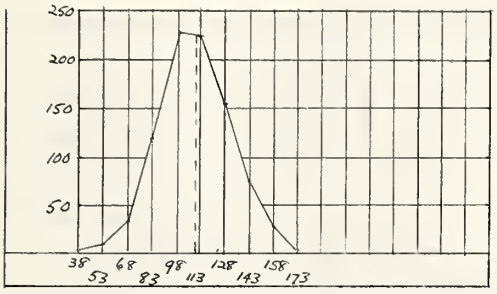
Figure 7. Fifty-yard dash performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Mid-points of intervals, in seconds.

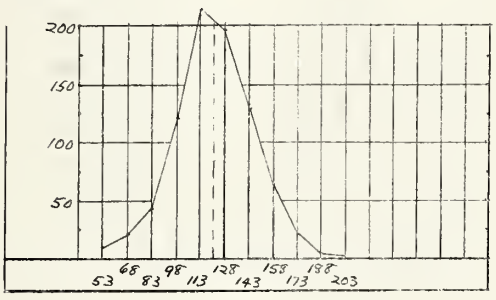
Age 11 years, N = 211
Median = 102



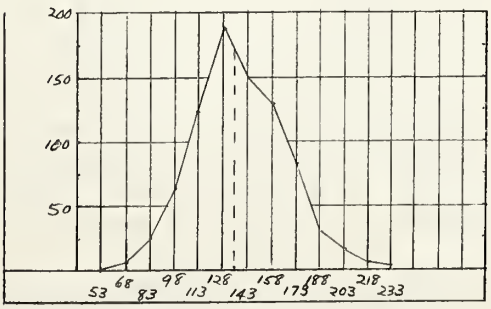
Age 12 years, N = 875
Median = 109



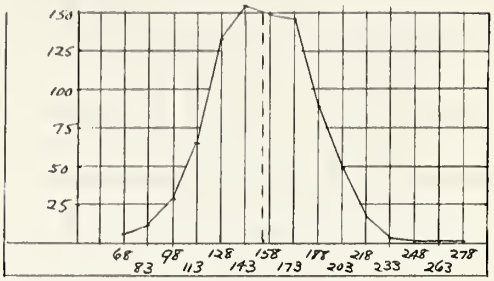
Age 13 years, N = 834
Median = 121



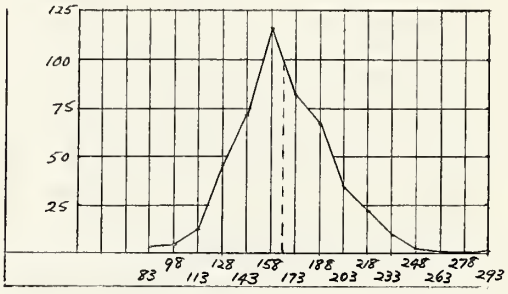
Age 14 years, N = 828
Median = 136



Age 15 years, N = 856
Median = 154



Age 16 years, N = 469
Median = 165



Age 17 years, N = 135
Median = 172

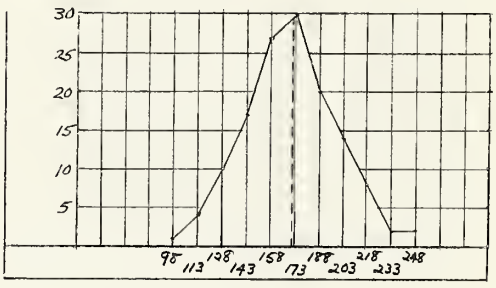
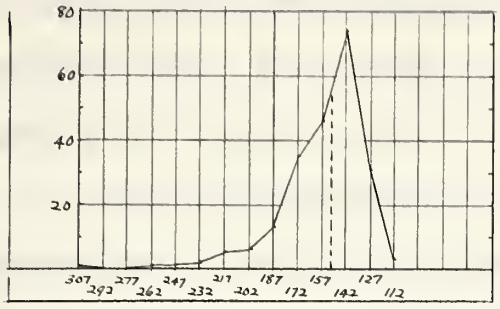


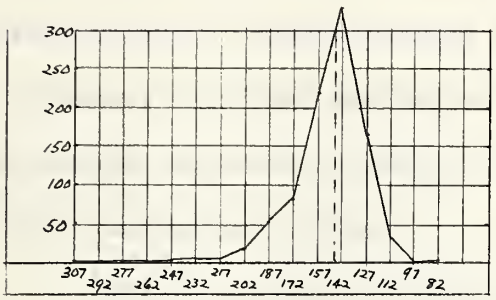
Figure 8. Softball throw performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Mid-points of intervals in feet.

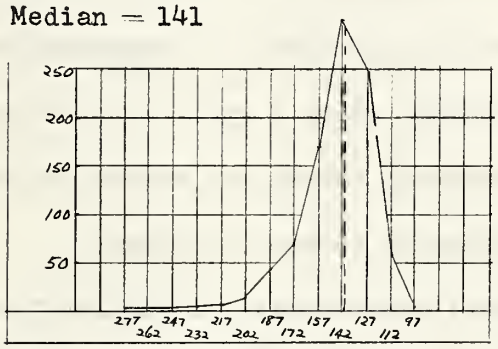
Age 11 years, N = 218
Median = 150



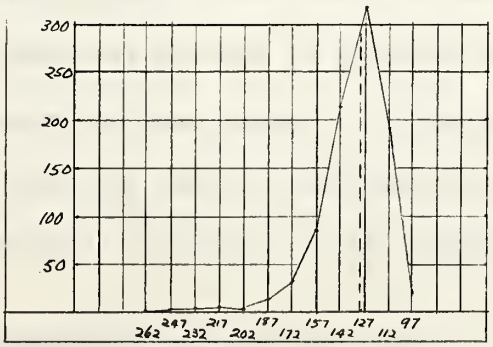
Age 12 years, N = 914
Median = 146



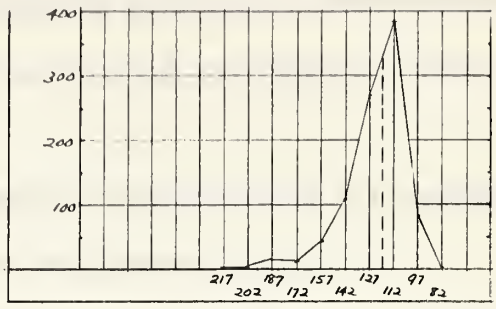
Age 13 years, N = 921
Median = 141



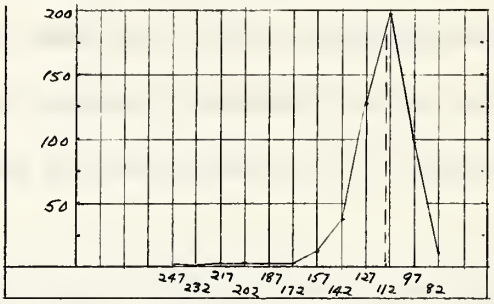
Age 14 years, N = 884
Median = 130



Age 15 years, N = 924
Median = 119



Age 16 years, N = 489
Median = 114



Age 17 years, N = 135
Median = 114

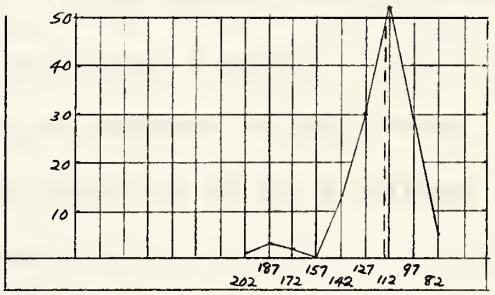


Figure 9. Six-hundred-yard run-walk performances of Edmonton Public Junior and Senior High School boys in October, 1959, distributed by age groups.

Ordinates: Frequencies.
Abscissae: Mid-points of intervals, in seconds.

hundred-yard dash and the maze run (somewhat resembling the shuttle run). He states that negative skewness in physical performance distributions is extremely rare. His findings in the pull-up and the standing broad jump agree with the present study.

Hall (13) found positive skewness in distributions for the six-hundred-yard run-walk, also opposed to the present study.

Garrett (12:307) states that performances by the same individual on different tests can be compared as standard scores, provided that the distributions of raw scores are of the same form. The distributions of the present data vary greatly in form, therefore standard scores would not provide accurate comparison between the performances of an individual on the various test items.

Garrett (12:312) further states that T-scaling forces normality upon the scores of a frequency distribution and is unwarranted if the distribution of a trait is not normal. In the present study an effort was made to study a whole population, not merely a sample. In the opinion of the writer the skewed distributions do represent the population.

Percentile scores do permit the comparison of the individual's performances on various test items, because each score positions his performance on a given item in relation to the performances of the general population on that item. To say that a boy is better than 75 per cent of other boys his age in sit-ups, and again in the six-hundred-yard run-walk, means the same thing in either case, regardless of the fact that standard scores for the two performances would be represented by quite different numbers, by reason of the opposing types of skewness involved.

Objectivity of the Test Items

Test items requiring the least need for judgment on the part of the administrator possess the highest objectivity. In the AAHPER test battery the need for judgment has been reduced to a minimum, but it still does exist. The elements of judgment required for each test item are given in the AAHPER Youth Fitness Test Manual (Appendix B). These elements were carefully emphasized at the briefing sessions described in Chapter IV of the present study. In the writer's opinion the test elements are easily understood by teachers and students, and are simple to perform. It is submitted that, within limits possible to large scale testing, the judgment elements were clarified and standardized.

Reliability of the Test Items

It was not found possible to re-test students on the test items at a later date. Teachers were unwilling to embark on further testing because of the inclement weather which had drawn out the original test period unduly, and they did not wish to curtail other activities in the program.

It is the purpose of the tests to obtain a profile of strengths and weaknesses, rather than a single score. The pull-up, sit-up, 50-yard dash, and the 600-yard run-walk were single-effort performances. The shuttle run consisted of two trials, but only the better of these was coded; likewise only the best of three trials was coded in the standing broad jump and in the softball throw. Therefore each item must be considered as a separate single-effort entity, making it impossible to apply split-half and Kuder-Richardson techniques (12:336).

Many other investigators have studied the reliabilities of various test items by the test-retest method. Brown (4) summarized the reported

reliabilities of twenty-six items, including six which are identical to, or closely resemble the ones in the present battery. He also reinvestigated the reliabilities himself.

Item	Previously reported reliabilities	Brown's finding
Pull-up	.86 - .99	.915
Two-minute sit-up	.71 - .99	.823
Dodge run	.68 - .97	.875
Standing broad jump	.66 - .98	.905
Sixty-yard dash	.84 - .97	.823
Softball throw	.89 - .97	.916

Waglow (44), in preparing a scoring table for two-minute sit-ups, noted that when raw scores were distributed in multiples of five, peaks occurred in the polygons at several places, which seemed to indicate a psychological or physiological influence to achieve those particular scores. The same characteristic may be noted in the Edmonton raw data in Figure 4. In the writer's opinion this evidence indicates questionable reliability in the sit-up as a test item.

Willgoose, Askew, and Askew (46) investigated the reliability of the six-hundred-yard run-walk at the Grade VIII level. They tested seventy Grade VIII boys at intervals of one week, using the same testers, and under identical weather conditions. For the first test, the boys were told that the test was for endurance and speed, that they should run at a speed they could maintain, not to sprint and run the risk of early exhaustion, to walk if they needed to do so, but to cover the distance in the shortest

possible time. For the second test the same directions were given, and in addition they were told that the purpose of the second test was not to break their former record, but to set their pace to do their best, as in the first test.

Scores for the first and second tests were compared in terms of rank order correlation, which was .92, and the difference between means, which were 132.4 seconds and 132.0 seconds. The standard error of the difference between these means was 2.87, giving a "t" of .139, indicating no significant difference between the means.

The results of the Wilgoose investigation are indeed surprising. In private conversation with Dr. Peter Sigerseth of the University of Oregon at Eugene, a member of the AAHPER Youth Fitness testing committee, the writer was told that the six-hundred-yard run-walk was included only after great controversy, because of the anticipated unreliability of the item.

Validity of the Test Items

Because of the interaction of muscle groups in movement, specific measurements of clearly defined qualities or quantities are extremely difficult to achieve. Usually, such measurements can be obtained only in well-equipped laboratories. Even then the isolation of factors is not always perfect. It seems obvious to the writer that the movements involved in the AAHPER test items measure more than is claimed for them as primary functions. In the opinion of many investigators, over many years, the various test items evaluate the following fitness factors, with the overlappings as indicated.

The pull-up is intended to measure strength and endurance of the arm and shoulder girdle muscles. Actually, strength measurement ceases after the completion of the first pull-up. From that point the event measures muscular endurance at that strength level.

The sit-up is intended to measure strength and endurance of the abdominal muscles and other hip flexors. The measurement of strength ceases when the subject proves his ability to sit up once. From that point muscular endurance at that strength level is measured.

The shuttle run is intended to measure agility, through the ability to change directions quickly. However, speed of the type used in the fifty-yard dash is also involved. Coordination is probably required, also.

The standing broad jump is intended to measure the explosive power of the muscles of the legs, but the muscles of the hips, back, abdomen, other hip flexors, and the arms, are all involved. Explosive power is considered to be a combination of strength and speed, and is probably not a pure factor.

The fifty-yard dash is intended to measure speed of the type required to move body segments in rapid sequence, but it also uses explosive power. The ability to start quickly appears to differ from the ability to achieve speed when once in motion. Henry and Kleeburger (14) noted this factor in developing the residual index.

The softball throw is intended to measure explosive power of the arm and shoulder girdle muscles, but explosive power of the legs, feet, and trunk is also used. The event also requires coordination, because many children, especially girls, have to be taught how to throw.

The six-hundred-yard run-walk is intended to measure cardio-respiratory

endurance, but speed and knowledge of pace are also involved.

In total, the events appear to test the elements of motor fitness as accepted by the writer on pages 7 and 8 of this study, except perhaps the element of body balance, which may be involved in the shuttle run. In the opinion of the writer the test items fail to isolate the elements of motor fitness, but still remain the most practicable items for use by ordinary classroom teachers.

II. COMPARISONS WITH OTHER COUNTRIES

Comparisons between AAHPER Norms and Edmonton Norms

The percentile scoring tables resulting from the AAHPER Youth Fitness tests as applied in the United States are contained in Appendix B. Unfortunately it was not possible to obtain arithmetic means, standard deviations, or numbers tested in the American classification groups. Lacking this information, it was impossible to compare statistically the differences between Edmonton and AAHPER averages, standard deviations, medians, or quartiles.

Visual comparisons have been provided in the present study in Figures 10 to 16, inclusive, on the following pages. Medians, quartiles, and the fifth and ninety-fifth percentiles have been plotted for American and Edmonton boys.

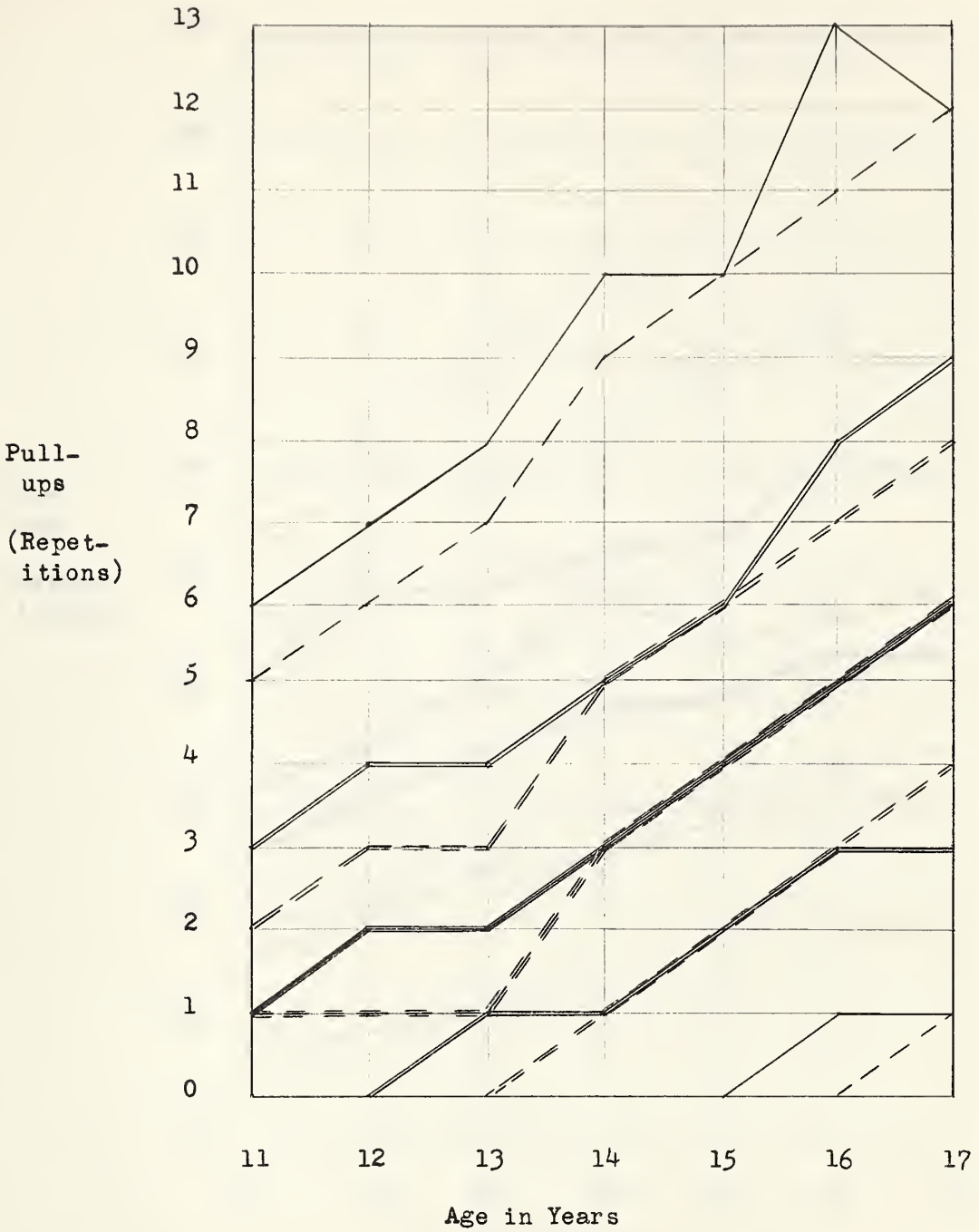


Figure 10. Comparison between pull-up achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
———	50th	— — — — —
———	25th and 75th	— — — — —
———	5th and 95th	— — — — —

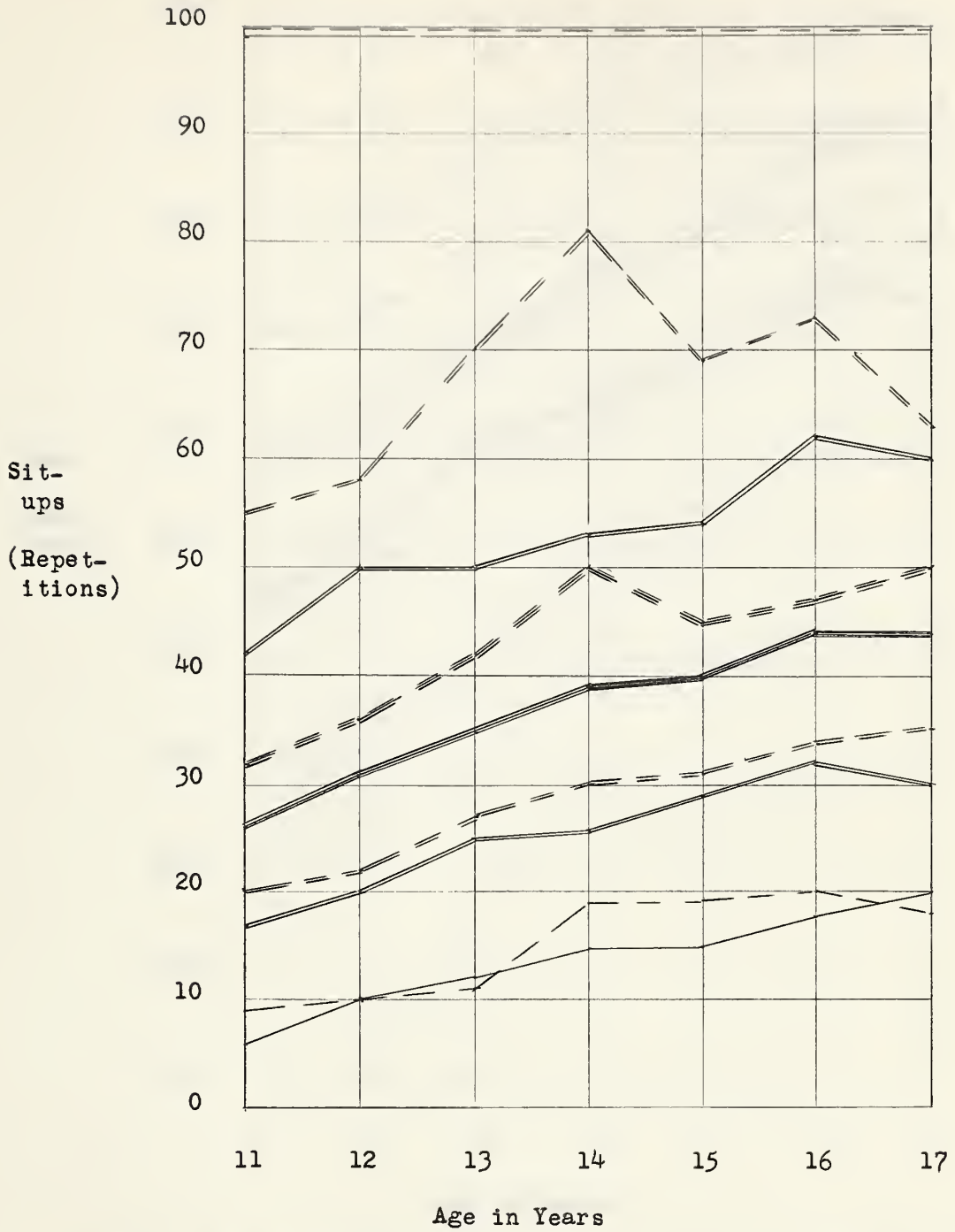


Figure 11. Comparison between sit-up achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	═ ═ ═ ═
═══	25th and 75th	═ ═ ═ ═
———	5th and 95th	— — — —

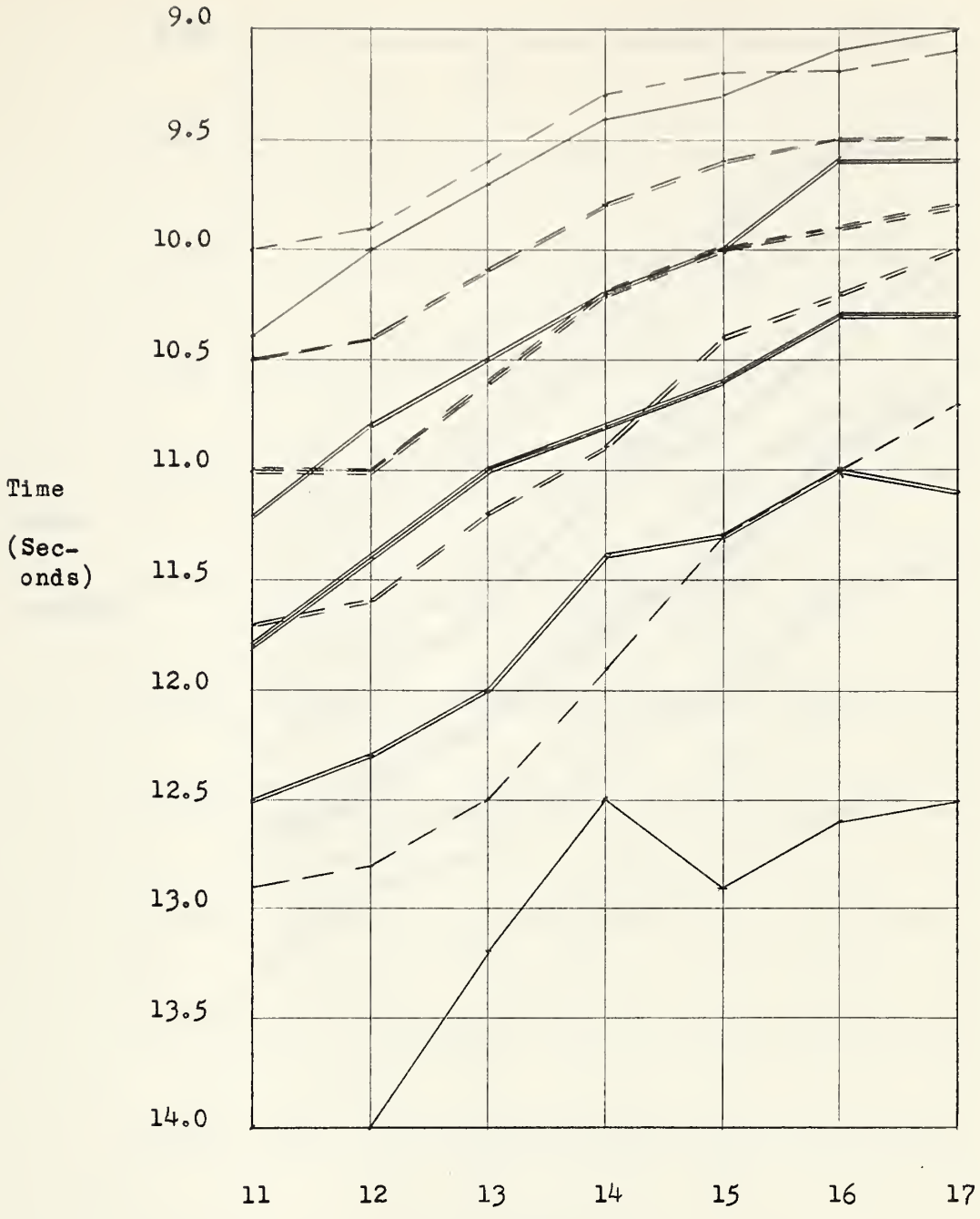


Figure 12. Comparison between shuttle run achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	- - - -
═══	25th and 75th	= = = =
———	5th and 95th	— — — —

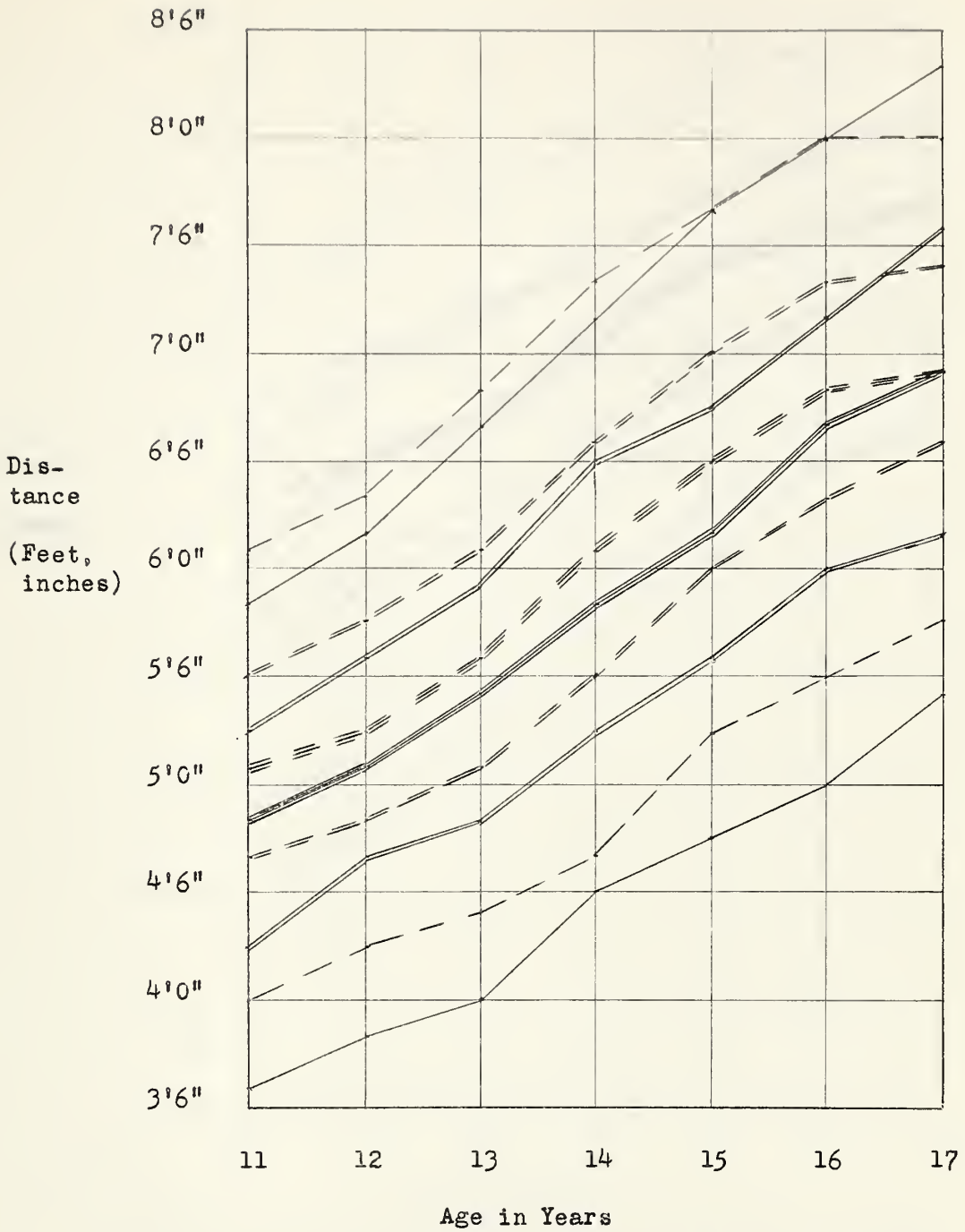


Figure 13. Comparison between standing broad jump achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	═ ═ ═
═══	25th and 75th	═ ═ ═ ═
———	5th and 95th	— — — —

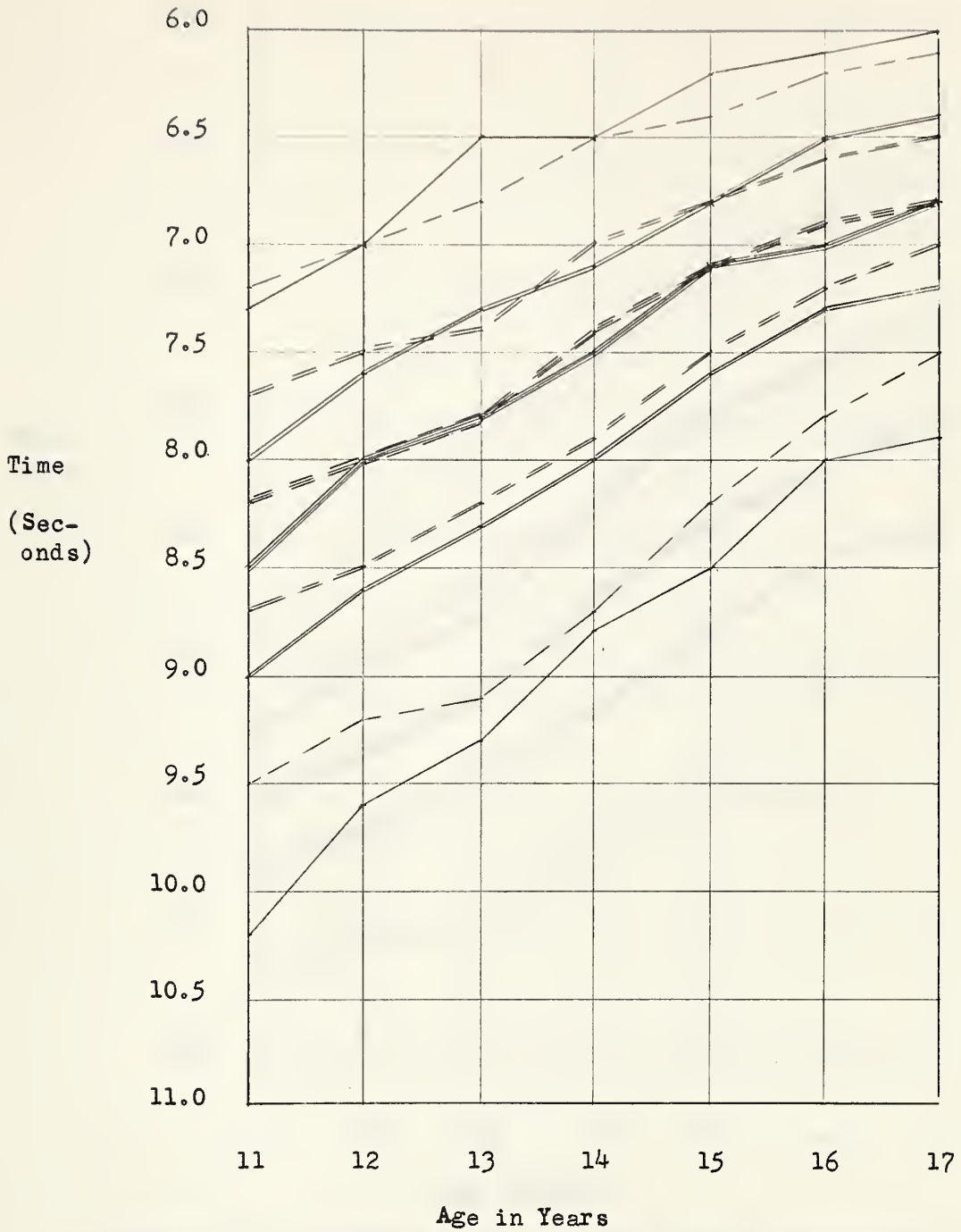


Figure 14. Comparison between fifty-yard dash achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	— — — —
═══	25th and 75th	— — — —
———	5th and 95th	— — — —

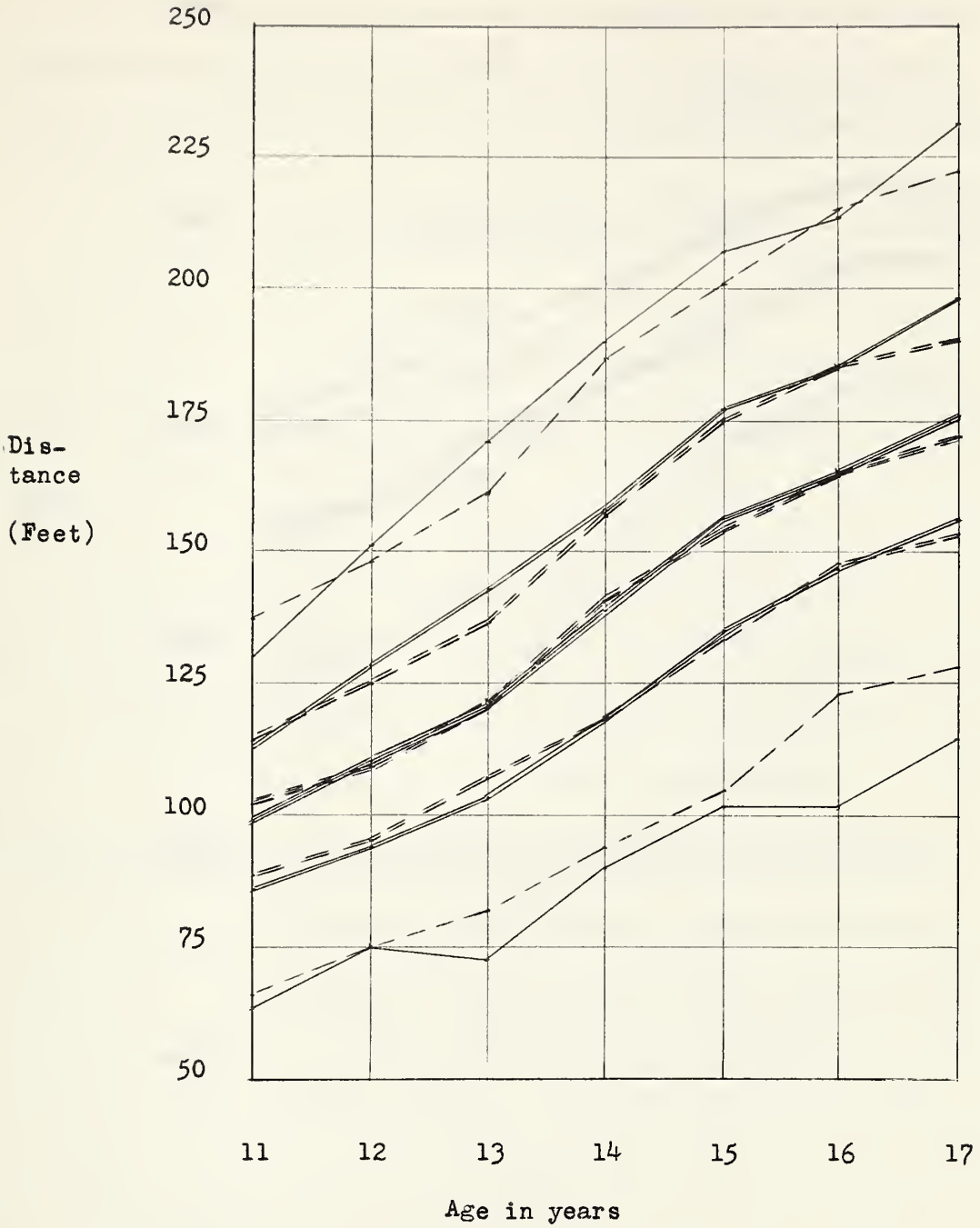


Figure 15. Comparison between softball throw achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	- - -
═══	25th and 75th	= = =
———	5th and 95th	— — —

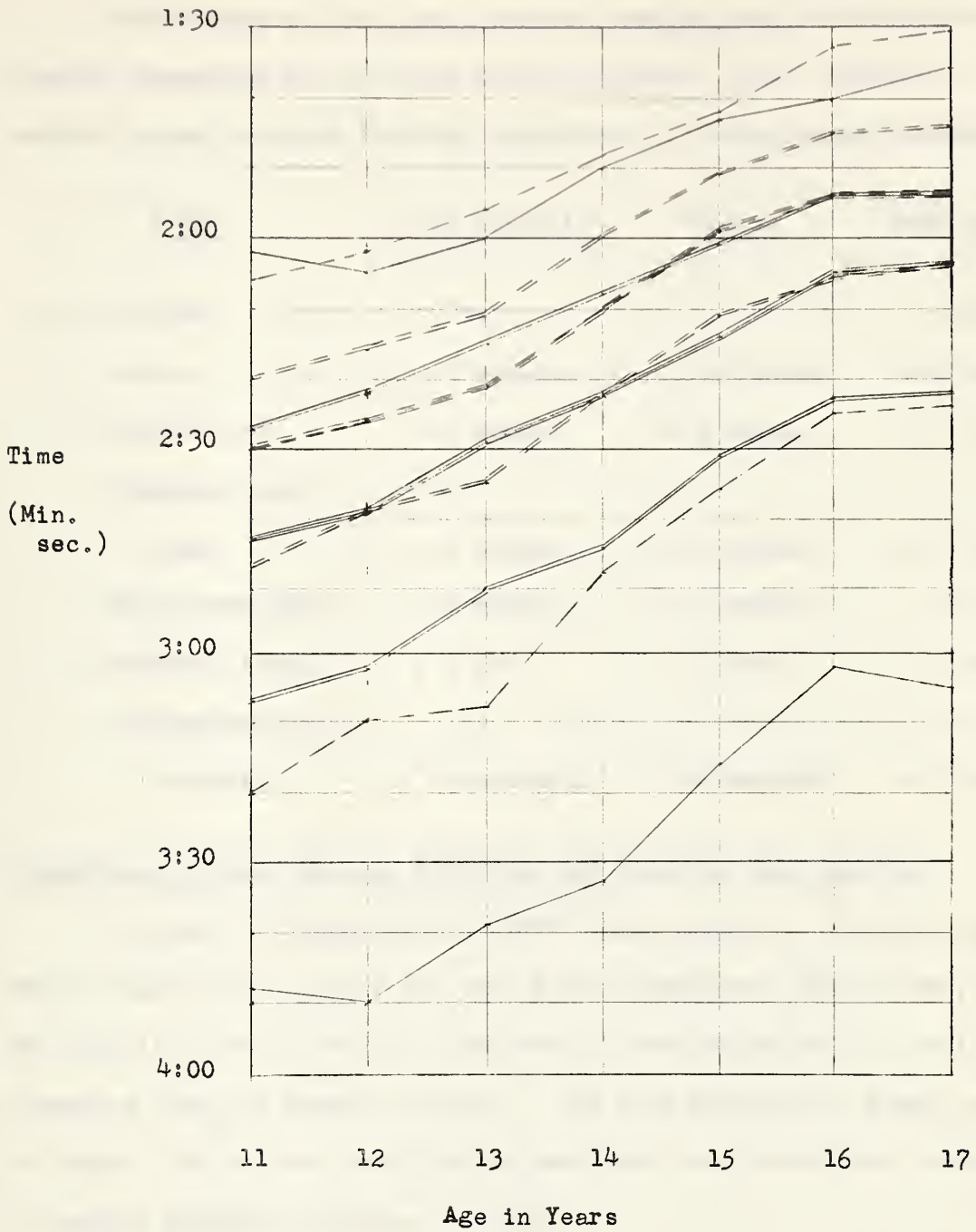


Figure 16. Comparison between six-hundred-yard run-walk achievements of boys in the American national sample of 1958 and the Edmonton sample of 1959.

American Data	Percentiles	Edmonton Data
═══	50th	═ ═ ═ ═
═══	25th and 75th	═ ═ ═ ═
———	5th and 95th	— — — —

Comparisons at the first quartile, median, and third quartile are roughly summarized for all ages in the following list. Positive or negative signs indicate Edmonton superiority or inferiority, respectively.

Event	First quartile	Median	Third quartile
Pull-up	0	0	− 1 pull-up
Sit-up	+ 3 sit-ups	+ 6 sit-ups	+ 14 sit-ups
Shuttle run	+.8 second	+.5 second	+ .4 second
Standing broad jump	+ 4 inches	+ 2 inches	+ 2 inches
Fifty-yard dash	+.1 second	+.1 second	0
Softball throw	+ 1 foot	− 1 foot	− 3 feet
Six-hundred-yard run-walk	+ 19 seconds	+ 12 seconds	+ 8 seconds

Comparisons between Danish, Edmonton, and American Test Results

Knuttgen (19) applied the AAHPER test battery to 319 boys in two Danish high schools during the period from September, 1959 to May, 1960. The schools cater to the top 5 per cent of the population in intelligence, preparing them for higher education. The boys ranged from grades seven to twelve. No special conditioning was given, and tests were conducted in regular physical education periods.

The Danish achievements were scored directly in percentiles by use of the AAHPER test manual. In cases where the same performance score was the norm for more than one percentile group, the Danish results were evenly divided between or among the percentile groups involved. The five

per cent groupings of the American tables were reduced to ten deciles. Age groups were not separated in the Danish data.

In order to provide a three-way comparison, the Edmonton raw scores were also scored by the American percentile tables, using Knuttgen's methods. Both the Danish and Edmonton frequencies were reduced to percentages of the number of boys involved in each test event. The American frequencies were already known, 10 per cent falling into each decile interval.

The resulting frequencies are plotted on the following two pages. The Edmonton and Danish percentages for each American decile can be read quite accurately directly from the graphs. In brief summary, the following figures can be quoted:

1. Pull-up: 59.8 per cent of Danes fell above the American median, but only 46.0 per cent of Edmontonians did so.
2. Sit-up: 60.5 per cent of both the Danish and Edmonton boys fell above the American median.
3. Shuttle run: 82.3 per cent of the Danish and 76.1 per cent of the Edmonton boys exceeded the American median.
4. Standing broad jump: 90.6 per cent of the Danish and 63.3 per cent of the Edmonton boys fell above the American median. 39.8 per cent of the Danes were in the top American decile.
5. Fifty-yard dash: 69.2 per cent of the Danish and 57.9 per cent of the Edmonton boys fell above the American median.
6. Softball throw: 49.3 per cent of the Edmonton boys, but only 31.2 per cent of the Danes were above the American median.
7. Six-hundred-yard run-walk: 95 per cent of the Danish and 74.4

Figure 17. Comparison between performances of secondary school boys of three countries, scored by the AAHPER percentiles.

Ordinates: Percentages of scores falling into AAHPER deciles.
Abscissae: AAHPER percentiles

Edmonton ——— Denmark - - - - - United States — — — —

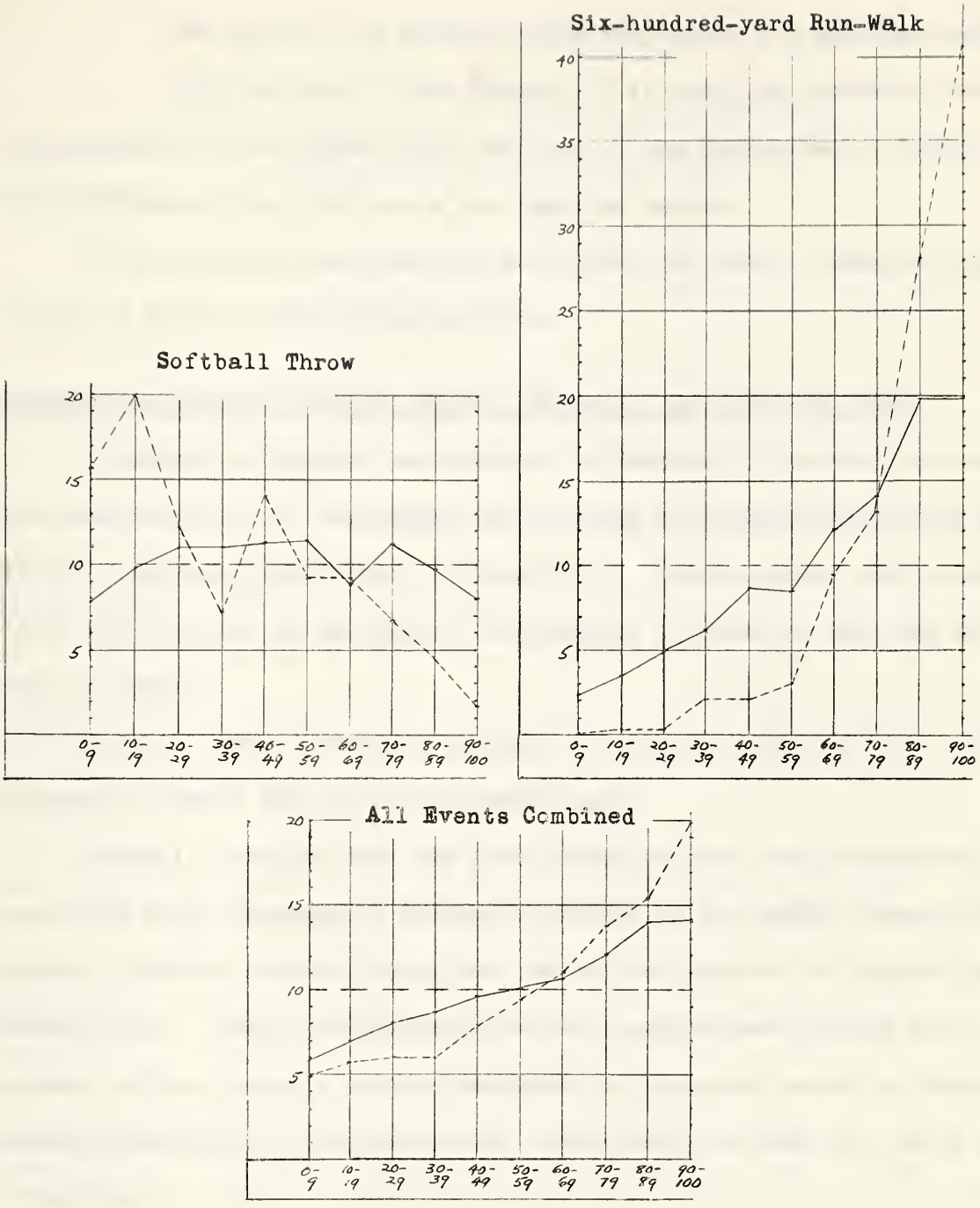


Figure 18. Comparison between performances of secondary school boys of three countries, scored by AAHPER percentiles.

Ordinates: Percentages of scores falling into AAHPER deciles.
Abscissae: AAHPER percentiles.

Edmonton ——— Denmark ------ United States — — — —

per cent of the Edmonton boys fell above the American median. 41.1 per cent of the Danes fell in the final American decile. Considering all test items, 69.4 per cent of the Danish and 61.1 per cent of the Edmonton boys fell above the American median.

Unfortunately, Knuttgen did not report the means, standard deviations, or percentiles for his own data.

Comparisons between British, Danish, Edmonton, and American Data

Campbell of England and Pohndorf of America (5) jointly directed the administration of the AAHPER test battery to 10,040 British boys and girls, completing the project by June, 1959. British means were calculated and reported by age groups, but numbers of cases at each age level were not given.

British means, Edmonton medians, and American medians have been compared in Table XXV, on the following page.

Finally, results from the four countries have been summarized by reporting their averages or medians as scored by the AAHPER percentile tables. British over-all means were scored and reported by Campbell and Pohndorf (5). Danish and Edmonton over-all medians were scored by the present writer, using a process analagous to the usual method of determining percentiles in grouped scores. Table XXVI, on page 131, shows the comparison.

Limitations of Comparisons Between Results from Different Countries

All of the comparisons made between the different countries must be viewed with very great caution, because of the differences in sampling procedure.

TABLE XXV

BRITISH, EDMONTON, AND AMERICAN PERFORMANCES

ON THE AAHPER YOUTH FITNESS TESTS

G.B. = British means in 1959

EDM. = Edmonton medians in 1959

U.S. = American medians in 1958

		Age in Years						
		11	12	13	14	15	16	17
Pull-up (repetitions)	G.B.	4	3	4	4	5	5	6
	EDM.	1	1	1	3	4	5	6
	U.S.	1	2	2	3	4	5	6
Sit-up (repetitions)	G.B.	47	49	53	56	54	51	48
	EDM.	32	36	42	50	45	47	50
	U.S.	26	31	35	39	40	44	44
Shuttle Run (seconds)	G.B.	11.3	11.1	11.0	10.7	10.6	10.2	10.0
	EDM.	11.0	11.0	10.6	10.2	10.0	9.9	9.8
	U.S.	11.8	11.4	11.0	10.8	10.6	10.3	10.3
Standing Broad Jump (inches)	G.B.	64	68	71	75	79	83	85
	EDM.	61	63	67	73	78	82	83
	U.S.	58	61	65	70	74	80	83
50-Yard Dash (seconds)	G.B.	8.1	8.0	7.7	7.6	7.2	6.9	6.7
	EDM.	8.2	8.0	7.8	7.4	7.1	6.9	6.8
	U.S.	8.5	8.0	7.8	7.5	7.1	7.0	6.8
Softball Throw (feet)	G.B.	92	98	108	121	128	138	140
	EDM.	102	109	121	136	154	165	172
	U.S.	99	110	121	139	156	165	176
600-Yard Run-Walk (seconds)	G.B.	138	130	128	121	118	110	107
	EDM.	150	146	141	130	119	114	114
	U.S.	163	159	149	142	134	125	124

TABLE XXVI

BRITISH, DANISH, EDMONTON, AND AMERICAN PERFORMANCES AS SCORED BY THE AAHPER PERCENTILE TABLES

	British means	Danish medians	Edmonton medians	United States medians
Pull-up	69th	58th	48th	50th
Sit-up	73rd	62nd	50th	50th
Shuttle Run	60th	73rd	70th	50th
Standing Broad Jump	72nd	85th	58th	50th
Fifty-yard Dash	60th	60th	55th	50th
Softball Throw	28th	32nd	49th	50th
Six-hundred-yard Run-walk	87th	86th	72nd	50th

The AAHPER data was based on a scientifically selected national sampling (see Appendix B, page 2).

The British sampling procedure was based at least partly upon advertising for interested teachers to conduct the test. The composition of the eventual sample was not revealed in the published results (5).

The Danish sample was extremely restricted, being drawn from only two schools, both of high academic level. Knuttgen (19) states that other Danish authorities have discovered no correlation between intelligence and physical fitness so long as I.Q.'s are above ninety-five. Nevertheless the possibility remains that the Danish sample might have been somewhat select physically as well as mentally.

The Edmonton sample was drawn from a single administrative unit, under the influence of a closely knit supervisory staff, and therefore did not represent either the Province of Alberta or the Dominion of Canada.

CHAPTER VII

SUMMARY AND CONCLUSIONS

I. A MAJOR OBJECTIVE: MEASURED GOALS IN PHYSICAL EDUCATION

The first major objective of the present study was to establish, for the first time in Edmonton public secondary schools, some measured goals for physical education, comparable to the goals of other school subjects.

The Unique Objective of Physical Education

To achieve the major purpose, it was decided to consider the accepted objectives of physical education in order to isolate those peculiar to physical education. The objectives of physical development do not overlap the areas served by other school subjects.

It was noted that official and public concern in North America has been focused for some time on an aspect of physical development termed "physical fitness". Concern has arisen because of some unfavorable comparisons which have been made between North American and European young adults and children. A higher percentage of rejections of North Americans for military service by reason of physical inadequacies, and a higher failure rate by North American children on certain physical performance tests, were discovered to be contributing reasons for the concern. The physical performance tests which came to the notice of the North American public were the Kraus-Weber Tests of Minimum Muscular Fitness (21). In Canada, including Edmonton, further evidence was added by the results of the Canadian Physical Efficiency Tests (32).

It was decided to attempt to establish measured goals in physical fitness.

An Attempt to Define and Analyze Physical Fitness

It was necessary to try to define the term "physical fitness". It was discovered by the writer that no precise definition, upon which could be based specific, measurable objectives of physical fitness, has yet been formulated. Clarke's concise statement (6:16) is quoted on page 5 of the present study as the best expression discovered by the writer. Clarke lists in very general terms the activities a person possessing adequate physical fitness should be able to do, but in so doing he does not actually define physical fitness. He mentions the performance of daily tasks without undue fatigue, an ample reserve of energy to enjoy leisure time, and the ability to meet unforseen emergencies. It seems obvious to the present writer that the physical abilities necessary to meet the requirements of work and play can be quantified only for individual human beings with specific responsibilities and interests. The minimum requirements will therefore be an individual affair. However, it also seems obvious to the writer that no individual can afford to be less fit than the maximum level which he is capable of attaining, if he is to be able to meet unforseen emergencies.

Study of the work of a number of investigators revealed the general opinion that muscular strength, muscular endurance, and circulo-respiratory endurance are the essential elements of physical fitness, with other elements, such as explosive power, agility, speed, and balance in contributory roles. The writer accepted this analysis for the present study.

Some investigators have attempted to establish standards of performance, i.e., what individuals should be able to achieve, in physical movements considered to embody the elements of physical fitness listed in the previous paragraph. Examples of this procedure are the Canadian Physical Efficiency Test (32) and the "5BX" program (36). Investigation by the present writer caused him to doubt the validity of the "physique category" method of assigning performance limits to individuals (see page 33). Further, the standards quoted were discovered to be "educated guesses", in part.

There is, in the writer's opinion, a very real need for physical educators to be able to determine the potential fitness levels of individuals, and to direct them toward achieving these levels. The work of Morgan and Adamson (28) in "Circuit Training" appears to offer promise in this direction.

In the absence of specific, measurable objectives of physical fitness, it was decided to limit the study to a determination of norms of performance actually existing in Edmonton public schools. The study was visualized as a first step toward determining standards at some later date.

Choice of a Test Instrument

Study of previous experiments reported in the literature led the writer to a series of conclusions.

Attempts to measure cardiovascular fitness by tests using blood pressures and pulse rates at rest and after exercise have correlated poorly with the ability of individuals to perform physical tasks.

Measures of strength, particularly the Rogers Strength Test (6:183)

and its variants, appear to correlate fairly well with general health status, but require expensive equipment.

Examination of tests designed to measure motor fitness led to the conclusion that they offer the best possibilities for administration by ordinary classroom teachers. See page 7 for a definition of motor fitness. The test finally chosen was the AAHPER Youth Fitness Test (see Appendix B). Reasons for the choice included weight of authoritative opinion, simplicity of test items, the balanced sample of test items, minimum equipment requirements, and the fact that the test, having been administered in several countries, offers international comparison.

Delimitation, Conduct of the Tests, and Verification of Data

It was decided to limit the experiment to boys in junior and senior high schools, but to attempt to test the entire sample within those limits.

Teachers were briefed, orally and in writing, in all details of the testing, and practised the procedures before conducting the tests. Methods of class control were outlined carefully.

The testing program was hampered by bad weather, but otherwise was faithfully conducted by most teachers.

Age, height, and weight data collected by the teachers were used by them to classify the boys by age in all schools, by the McCloy Formula No. 1 in junior high schools, and by the Cozens-Trieb-Neilson formula in senior high schools.

All testing data were verified by detailed interviews with the teachers. Considerable data were discarded as a result. All computations were reworked by the writer.

The Percentile Norms

All data were transferred to IBM cards, then sorted according to the classification systems noted. Twenty-four percentile scoring tables were produced in a form designed for use as individual profile charts.

Evaluation of the Data

Every effort was exerted to obtain objective, reliable, and valid data. All factors involving judgment were standardized as far as possible at the briefing. Other investigators' assessments of reliability were all high. However, in the opinion of this writer, psychological factors took effect in certain events in varying amounts partly dependent upon the personality of the different teachers. The events most affected, in his opinion, were the sit-up, the six-hundred-yard run-walk, and the pull-up. Validity is open to question. The test events do not, in the opinion of this writer, clearly isolate the elements of motor fitness, each of which appears in more than one test event.

The suitability of the percentile form of scoring appeared to be justified, because the frequency polygons of distribution of data were recognizably skewed for five of the seven test items.

The writer recognizes the possibility that the norms may be of temporary validity, if they have the desired effect of motivating increased physical activity.

It is hoped that the percentile scoring tables and profile charts may help to improve the fitness of Edmonton boys in three ways:

1. By motivating individual boys toward improved motor fitness.
2. By providing teachers with a better understanding of individual differences, and of inter-class differences.

3. By possible identification of unusual boys (at either end of the scoring scale) for individual treatment.

II. THE OBJECTIVE OF COMPARISON BETWEEN COUNTRIES

It was possible to compare the results of the original AAHPER project in 1958, a very similar British project in 1959, a Danish project in 1959, and the Edmonton project. Comparisons were largely visual, and incomplete statistically, due to lack of information regarding numbers tested, means, and standard deviations in the first three samples noted. Further, the sampling procedures were very dissimilar, the AAHPER sample being a true national sample of American youth, the larger British sample of unknown composition, possibly weighted toward "good" programs, and the small Danish sample consisting of two schools of highly academic students.

Within the limits of sampling differences it may be concluded that the present study confirms the results of the Kraus-Weber tests, in that boys of the United States and of Canada (as represented by Edmonton public schools) appear to be inferior in motor fitness to boys of Britain and of Europe (as represented by two Danish schools), insofar as motor fitness is measured by the Youth Fitness Tests of the American Association for Health, Physical Education, and Recreation.

CHAPTER VIII

IMPLICATIONS

The conclusions of the preceding chapter, and certain other foregoing discussions imply the need for further investigations in several areas, in the opinion of the writer.

Tests at regular intervals. Proven tests, including the present study, should be repeated at regular intervals. In this way could be measured the effects of changes of cultural pattern, or of changes in physical education programs. By noting trends, predictions could be made, and remedial measures could be taken if necessary.

The effect of unfamiliarity with test items. Research is needed to determine the effect of unfamiliarity of subjects with test items. The experience of Nyhaug in New Westminster (16) seems to indicate that Canadians may merely have "learned" the Kraus-Weber test events, without their fitness being significantly affected. The unfamiliarity of Edmonton boys with pull-ups may have been a partial reason for the low norms recorded.

A possible endurance ratio. The possibility of using the time for the fifty-yard dash and the six-hundred-yard run-walk to compute an endurance ratio should be investigated.

Reasons for differences between countries. Comparisons have been made between the motor fitness of boys in the United States, Edmonton, Britain, and Denmark. Are the differences due in any great measure to differences in physical education programs, or are they due to differences

in the total "way of life" of the peoples ? It is possible that a series of test projects should be conducted, using populations from various cultures in which different types of physical education programs have been conducted, under conditions of scientific control.

Research in classification systems. Clarke, in discussing the Rogers strength tests, says about norms in general:

> "....the establishment and application of norms for all subjects in a particular designation do not allow for the many factors that make individuals "normally" different. This difficulty is not confined alone to norms applied to physical fitness testing; it is true wherever norms are used in human measurement." (6:206)

Whether the general level of physical fitness of a population is high or low, there will always be as many individuals below the median as above it. For many of these individuals, their scores may well indicate what really should be their normal relationship to the general population. Teachers attempting to interpret the results of the tests for any given individual should consider and separate factors which may or may not be controllable by either the individual tested or by those responsible for his welfare. Controllable factors might include amount of exercise, state of nutrition, amount of rest, and health habits. Examples of factors probably not effectively controllable, mentioned by McCloy (23:93), are age, height, weight, muscular viscosity or potential contraction speed, relative numbers of muscular fibres that can be thrown into contraction at once in a voluntary maximum contraction, mental or "character" factors of persistence, courage, and coolness, and the state of reciprocal innervation, sometimes called "tying up".

In the opinion of the writer, research is required to bring within

reach of busy teachers relatively simple classification measures which include more of the uncontrollable factors. The factors of age, height, and weight have been used in various ways in the present study. The factor of body build has been the subject of many studies, some of which are not readily usable by teachers lacking specialist training. The matter of classification requires careful re-examination. The existing age-height-weight formulae appear to have serious defects. By common sense it seems unfair to match a very tall, slender boy against a short, heavy boy, even though their classification indices might be identical. In running and jumping, the advantage lies with the first boy, in contact sports, with the second. Such situations occur frequently under existing systems.

The "physique categories" devised by Orban and Plewes (32, 36) appear to bring a measurement of body build within workable limits. (See the first page of Appendix A). The boys whose performance data form the basis for the present study were all classified according to "physique category", and the information was coded on the IBM cards. It should be possible, for example, to determine whether age is a significant factor in performance as related to physique categories. If so, the three standard measures of age, height, and weight, might still suffice to provide a more equitable classification system.

Other research in physical education. Physical education has long suffered from lack of recognizable order and progression, by comparison with other subject areas. Research in the area of physical fitness covers only one facet of physical education. Needed also are achievement standards in skills and knowledge. Research should also be directed toward

measurement of the sociological outcomes of physical education.

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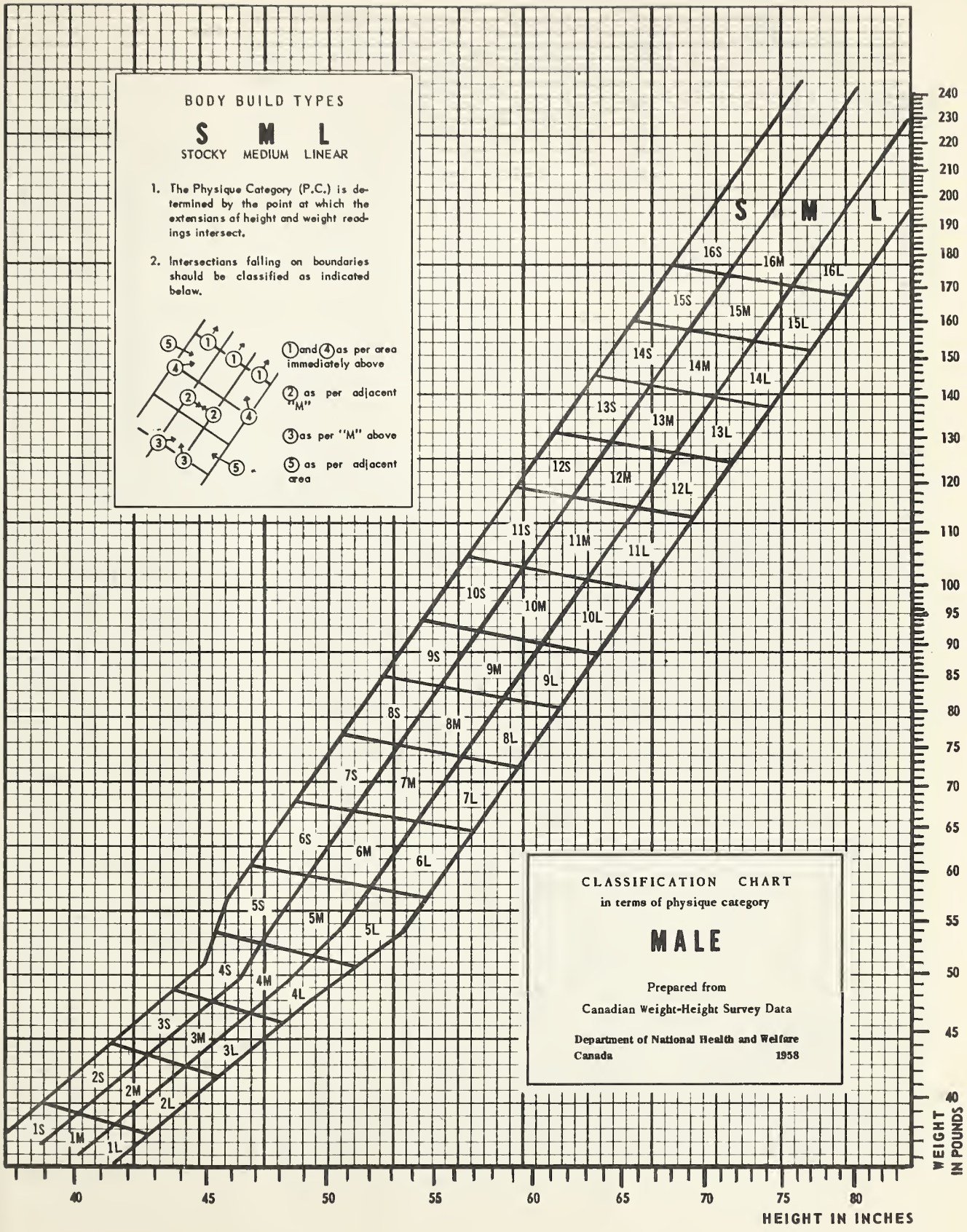
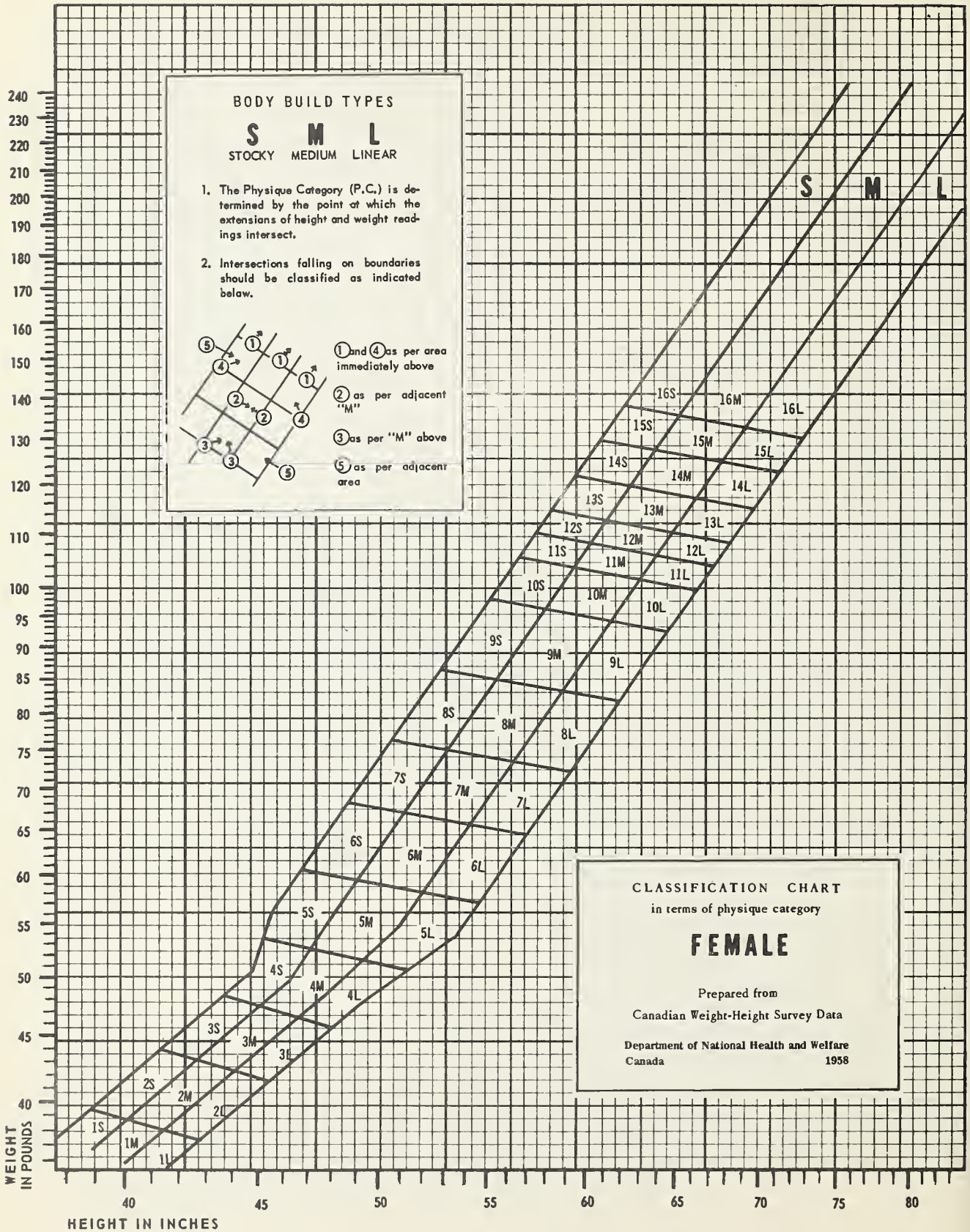
APPENDIX A

MISCELLANEOUS MATERIALS

EPSB


BODY BUILD TYPES
S M L
STOCKY MEDIUM LINEAR
1. The Physique Category (P.C.) is determined by the point at which the extensions of height and weight readings intersect.
2. Intersections falling on boundaries should be classified as indicated below.
1 and 4 as per area immediately above
2 as per adjacent "M"
3 as per "M" above
5 as per adjacent area
S M L
16S 16M 16L
15S 15M 15L
14S 14M 14L
13S 13M 13L
12S 12M 12L
11S 11M 11L
10S 10M 10L
9S 9M 9L
8S 8M 8L
7S 7M 7L
6S 6M 6L
5S 5M 5L
4S 4M 4L
3S 3M 3L
2S 2M 2L
1S 1M 1L
CLASSIFICATION CHART
in terms of physique category
MALE
Prepared from
Canadian Weight-Height Survey Data
Department of National Health and Welfare
Canada 1958
240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 95 90 85 80 75 70 65 60 55 50 45 40
WEIGHT IN POUNDS
40 45 50 55 60 65 70 75 80
HEIGHT IN INCHES


BODY BUILD TYPES
S M L
STOCKY MEDIUM LINEAR
1. The Physique Category (P.C.) is determined by the point at which the extensions of height and weight readings intersect.
2. Intersections falling on boundaries should be classified as indicated below.
① and ④ as per area immediately above
② as per adjacent "M"
③ as per "M" above
⑤ as per adjacent area
S M L
16S 16M 16L
15S 15M 15L
14S 14M 14L
13S 13M 13L
12S 12M 12L
11S 11M 11L
10S 10M 10L
9S 9M 9L
8S 8M 8L
7S 7M 7L
6S 6M 6L
5S 5M 5L
4S 4M 4L
3S 3M 3L
2S 2M 2L
1S 1M 1L
CLASSIFICATION CHART
in terms of physique category
FEMALE
Prepared from
Canadian Weight-Height Survey Data
Department of National Health and Welfare
Canada 1958
WEIGHT IN POUNDS
240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 95 90 85 80 75 70 65 60 55 50 45 40
40 45 50 55 60 65 70 75 80
HEIGHT IN INCHES

EDMONTON PUBLIC SCHOOL BOARD

10733 - 101 Street

Edmonton, Alberta

Physical Education Division

September 22, 1959

Mr. R.H. Routledge
Assistant Supervisor of Physical Education
Edmonton Public Schools
EDMONTON, Alberta

Dear Mr. Routledge:

After reading your proposal to make a study to establish standards and norms of the objective items of the Physical Fitness Test Battery of the A.A.H.P.E.R. among the boys in Grades Seven through to Eleven, it pleases me very much to give you my blessing on this study.

We are in constant need of re-affirming our stand in Physical Education by assessing material developed by other people as well as ourselves.

Please check with Mr. G. R. Conquest, Assistant Superintendent of Secondary Education, to seek permission for the privilege of using the material obtained in your thesis.

Yours truly,

A. S. Bird
Supervisor of Physical Education

ASB/ mk

EDMONTON PUBLIC SCHOOL BOARD

10733 - 101 Street

Edmonton, Alberta

24th September 1959.

Mr. R.H. Routledge,
Assistant Supervisor of
Physical Education,
Edmonton Public School Board,
Edmonton, Alberta.

Dear Mr. Routledge:

I have received your request, dated 23rd September 1959, for permission to use certain data as the basis for your thesis for the Master of Education degree. I note that this data will result from a boys' physical fitness test project which has been approved by Mr. Stuart Bird, Supervisor of Physical Education, as a part of this year's program in our Junior and Senior High Schools.

I am pleased to grant you permission to use this data.

Yours truly,

G.R. Conquest,
Assistant Superintendent
for Secondary Education.

GRC:dc

Edmonton Public Junior and Senior High Schools
PHYSICAL FITNESS RESEARCH PROJECT
October, 1959

September 23rd, 1959

Mr. _____
Physical Education Teacher
_____ School

Dear _____

The Physical Education Supervisors appeal to you to attend the in-service evening session at 7:30 p.m. sharp on Monday, 28th September, at Victoria Composite High School gymnasium.

The session, labelled "touch rugby" in your schedule, will be changed to a "physical fitness research project" session. It will be used as a briefing session for administering in all our boys' classes the National Fitness Tests of the American Association for Health, Physical Education, and Recreation (AAHPER). It is planned to run these tests during the first two weeks of October, approximately, because some of the test items must be run out-of-doors. The tests must be administered to all of the boys in the system in order to obtain enough numbers in the classification groups at either end of the range of sizes to calculate reliable norms. Therefore it will be necessary to brief all of the male physical education teachers.

There are several reasons for the test program. Firstly, American and Canadian boys have been shown to be inferior to European boys in physical fitness. Edmonton boys tested by Dominion government officials during 1957-8 were no exception. Secondly, there is public and official pressure to remedy the situation. Many factors, including lack of time, space, and equipment, may be partial causes. It must be admitted, however, that the Canadian-American games-centred physical education program has lacked physical fitness content. We are attempting to correct this defect partially by emphasizing the Dominion government-RCAF "5BX" program. Thirdly, we need to be able to measure present status and future improvement in individuals or groups. It is impossible to do so at present, except by use of norms developed in other parts of the world. The main purpose of the present project is to prepare such norms for the boys in our schools.

It will be made clear at the briefing why the AAHPER National Fitness Tests have been chosen as the measuring instrument for this project. The project has been approved as a needed feature of our program by Mr. Stuart Bird, Supervisor of Physical Education, and by some of our most experienced physical education teachers. The Superintendent is aware of the proposed project, and has expressed approval.

The tests will be administered in physical education class periods. Boys in three pilot study classes last June enjoyed performing the test items.

Use of out-of-class time of teachers will be restricted to the briefing session, which is comparable to any other approved in-service feature,

(continued)

preparation of a small amount of equipment and lining of a few testing areas, comparable to preparation for any other teaching unit, and simple conversion from tables of age-height-weight data to three classifications.

Data must be as accurate as possible in order to draw comparisons with American standards now published, and to compute our own standards, hence the need for careful briefing on Monday, 28th September.

Each teacher is asked to attend the briefing. Each school is asked to locate and bring to the briefing the following equipment:

1. One (preferably two) 50- or 100-foot measuring tapes for each teacher who will be teaching at any given period. Steel tapes are preferred. Cloth tapes will be calibrated at the briefing session. Search all possible sources. Bring at least one.

2. One (preferably two) stop-watches for each teacher who will be in operation at any given period. Watches recording tenths of seconds are preferred, but those showing fifths will be accepted. Watches will be checked and calibrated at the briefing session against accurate time-pieces. Watches are in short supply. Please search all possible sources before giving up the search. Here are some suggestions:

   (a) Personal watches owned by the principal or other teacher.
   (b) Other school subject departments, such as typing teachers.
   (c) Students' unions.
   (d) Staffs or departments of your own or nearby elementary schools.
   (e) Private citizens, particularly track and field enthusiasts.
   (f) Other sources.

Stop-watches may be our biggest single problem; please try hard !

Bring your running shoes. We will need to perform and practise measuring the tests.

See you Monday ! Thanks in advance for supporting Edmonton's first P. E. research on this scale.

Yours sincerely,
Bob Routledge,
Assistant Supervisor of Physical Education.

CONVERSION OF AGE IN YEARS, AND BIRTHDAY, TO AGE IN YEARS AND MONTHS

1. The Classification Sheet should be glued to the end of the Raw Data Sheet.
2. Transfer all "whole years" from column "i" of the Raw Data Sheet to the first column of the Classification Sheet.
3. Convert all birthdates to "extra months" from the following table, and enter in the same column after "whole year" entries:

Birthdays falling on:	Extra months of age to be added
2 October to 16 October, inclusive:	12 months, i.e. 1 whole year
17 October to 16 November, inclusive:	11 months
17 November to 16 December, inclusive:	10 months
17 December to 16 January, inclusive:	9 months
17 January to 16 February, inclusive:	8 months
17 February to 16 March, inclusive:	7 months
17 March to 16 April, inclusive:	6 months
17 April to 16 May, inclusive:	5 months
17 May to 16 June, inclusive:	4 months
17 June to 16 July, inclusive:	3 months
17 July to 16 August, inclusive:	2 months
17 August to 16 September, inclusive:	1 month
17 September to 16 October, inclusive:	0 months

4. Multiply age in years by 12, and add the extra months to obtain age in months.

Note: The table above applies only to ages recorded on October 1st, or as if the recording date were October 1st.

STOP-WATCH CORRECTIONS FOR SHUTTLE RUN AND 50-YARD DASH

Watch Error for 5 min.	Runner's Time	Correction, to be added or subtracted
0 to 0.7"	all times	0
0.8"	18.8" & up	.1"
0.9"	16.7" & up	.1"
1.0"	15.0" & up	.1"
1.1"	13.6" & up	.1"
1.2"	12.5" & up	.1"
1.3"	11.5" & up	.1"
1.4"	10.7" & up	.1"
1.5"	10.0" & up	.1"
1.6"	9.4" & up	.1"
1.7"	8.8" & up	.1"
1.8"	8.3" & up	.1"
1.9"	7.9" & up	.1"
2.0"	7.5" & up	.1"

STOP-WATCH CORRECTIONS FOR 600-YARD RUN-WALK

Watch Error for 5 min.	Runner's Time	Correction, to be added or subtracted
0 to 0.4"	all times	0
0.5"	5:00 & up	1 sec.
0.6"	4:10 & up	1 sec.
0.7"	3:34 & up	1 sec.
0.8"	3:08 & up	1 sec.
0.9"	2:47 & up	1 sec.
1.0"	2:30 & up	1 sec.
1.1"	2:16 & up	1 sec.
	6:49 & up	2 sec.
1.2"	2:05 & up	1 sec.
	6:15 & up	2 sec.
1.3"	1.55 & up	1 sec.
	5:46 & up	2 sec.
1.4"	1:47 & up	1 sec.
	5:21 & up	2 sec.
1.5"	1:40 & up	1 sec.
	5:00 & up	2 sec.
1.6"	1:34 & up	1 sec.
	4:41 & up	2 sec.
1.7"	1:28 & up	1 sec.
	4:25 & up	2 sec.
1.8"	1:23 & up	1 sec.
	4:10 & up	2 sec.
1.9"	1:19 & up	1 sec.
	3:57 & up	2 sec.
	6:35 & up	3 sec.
2.0"	1:15 & up	1 sec.
	3:45 & up	2 sec.
	6:15 & up	3 sec.

Underline in red in each table your own watch error, and use only the correction for it.

EDMONTON PUBLIC JUNIOR AND SENIOR HIGH SCHOOL BOYS PHYSICAL FITNESS TEST PROJECT (A.A.H.P.E.R.) - OCTOBER, 1959 — R.H. ROUTLEDGE - ASS'T. SUPERVISOR OF PHYS. EDUC.

CODE IDENTIFICATION (FOR USE WITH IBM CARDS, BUT ADAPTABLE TO TEACHER USE)					NAME		(i) AGE		(ii) HEIGHT	(iii) WEIGHT	I PULL-UP	II SIT-UP	III SHUTTLE RUN			IV STANDING BROAD JUMP			BEST TRIAL	V 50 DASH	VI SOFT BALL THROW	VII 600 RUN-WALK	
(FOR USE WITH IBM CARDS, BUT ADAPTABLE TO TEACHER USE)					PRINT, ALPHABETICALLY BY SURNAMES		AGE IN YEARS ONLY, LAST BIRTHDAY	BIRTHDAY: DAY, MONTH, YEAR	IN INCHES, TO NEAREST HALF, AS DECIMAL	TO NEAREST POUND	NUMBER OF CORRECT REPETITIONS COMPLETED	NUMBER OF CORRECT REPETITIONS COMPLETED	IN SECONDS AND TENTHS TO NEAREST TENTH, RECORDED AS DECIMAL. UNDERLINE BETTER OF 2 TRIALS AND TRANSFER TO THIRD COLUMN →			IN FEET AND INCHES TO NEAREST INCH, UNDERLINE BEST OF 3 TRIALS AND TRANSFER TO FOURTH COLUMN →			CONVERTED TO INCHES	IN SEC. AND TENTHS TO NEAREST TENTH, AS DECIMAL	RECORD BEST OF 3 TRIALS IN FEET, TO NEAREST FOOT	RECORD IN MIN. AND SEC. TO NEAREST SECOND	CONVERT TO SECONDS
SCHOOL	TEACHER	GRADE	CLASS	PUPIL	SURNAME	FIRST NAME							TRIAL I	TRIAL II	TRIAL III	TRIAL I	TRIAL II	TRIAL III					
1, 2	3, 4	5, 6	7, 8, 9	10, 11, 12, 13	← IBM CARD COLUMNS →		14, 15		16, 17, 18	19, 20, 21	22, 23	24, 25, 26			27, 28, 29				30, 31, 32	33, 34, 35	36, 37, 38		39, 40, 41
SAMPLE ENTRY					AABELSON	ARTHUR	15	24 JUNE/44	69.0	127	04	056	09.8	09.7	09.7	6'5"	6'8"	6'6"	080	06.9	172	2:04	124
1, 2	3, 4	5, 6	7, 8, 9	10, 11, 12, 13	← IBM CARD COLUMNS →		14, 15		16, 17, 18	19, 20, 21	22, 23	24, 25, 26			27, 28, 29				30, 31, 32	33, 34, 35	36, 37, 38		39, 40, 41

EXACT HALF-VALUES COUNT AS NEXT VALUE ABOVE, E.G.: HEIGHT: 66¼ IN. = 66·5 IN., WEIGHT: 134½ LB. = 135 LB., JUMP: 6'1½" = 6'2", THROW: 175½ FT. = 176 FT., ETC.

RAW DATA SHEET — SCHOOL _____ (NAME) _____ (SR. OR JR.) HIGH. TEACHER _____ (SURNAME) _____ (FIRST NAME) CLASS _____ (GRADE) _____ (LETTER IDENTIF.) — RECORD PUPILS OF ONE GRADE ONLY, THIS SHEET — DATE OF AGE-TAKING _____

EDMONTON PUBLIC JUNIOR AND SENIOR HIGH SCHOOL BOYS PHYSICAL FITNESS TEST PROJECT (A.A.H.P.E.R.) - OCTOBER, 1959 R.H. ROUTLEDGE - ASS'T. SUPERVISOR OF PHYS. EDUC.

AGE		I NEILSON-COZENS CLASSIFICATION (AAHPER YOUTH FITNESS TEST MANUAL, TOP OF PAGE 29) GRADES VII, VIII, AND IX ONLY						II COZENS-TRIEB-NEILSON CLASSIFICATION (AAHPER YOUTH FITNESS TEST MANUAL, BOTTOM OF PAGE 29) ALL BOYS, GRADES VII - XII INCLUSIVE						III DR. C.H. McCLOY'S FORMULA #1, AS APPLIED IN EDMONTON PUBLIC SCHOOLS GRADES VII, VIII, AND IX ONLY						CANADIAN PHYSICAL EFFICIENCY TESTS' "PHYSIQUE" CATEGORIES	REMARKS
IN YEARS AND MONTHS, TO CLOSEST MONTH, ON DATE OF AGE-TAKING	CONVERTED TO MONTHS (YEARS X 12 PLUS EXTRA MONTHS)	AGE EX-PONENT	HEIGHT EX-PONENT	WEIGHT EX-PONENT	TOTAL OF EX-PONENTS	CLASS LETTER	CLASS NUM-BER	AGE EX-PONENT	HEIGHT EX-PONENT	WEIGHT EX-PONENT	TOTAL OF EXPONENTS	CLASS LETTER	CLASS NUM-BER	AGE EXPONENT	HEIGHT EXPONENT	WEIGHT EXPONENT	TOTAL OF EXPONENTS	CLASS LETTER	CLASS NUM-BER		
	42,43,44				45,46		47				48,49,50		51				52,53,54		55	56,57,58	
15-3	183	11	17	14	42	H	8	31	33	20	084	B	5	305	414	127	846	B	8	13:4	← SAMPLE ENTRY
	42,43,44				45,46		47				48,49,50		51				52,53,54		55	56,57,58	

16 DAYS OR MORE SHALL COUNT AS A WHOLE MONTH. 15 DAYS OR FEWER SHALL BE DISCARDED.

CLASSIFICATION SHEET SCHOOL ________ (NAME) ________ (SR. OR JR.) HIGH. TEACHER ________ (SURNAME) ________ (FIRST NAME) CLASS ________ (GRADE) ________ (LETTER IDENTIFICATION)

RECORD PUPILS OF ONE GRADE ONLY ON THIS SHEET

DATE OF AGE-TAKING ________

CONDENSED TEACHER-INTERVIEW CHECK ON RAW DATA

DATE_____ SCHOOL_____ TEACHER_____

Class lists. Completeness; why some not tested; partial test of "transfers" in or out of school.

Ages. Whole years; birthdays; re-check birthdays circa October 1st.

Heights. Error in scale ?; correction applied ?; footwear; posture; interpretation of "nearest half-inch".

Weights. Accuracy of scale; pre-balancing; clothing; interpretation of "nearest pound".

Pull-ups. Diameter, height, location, and rotation possible in bar; grasp; arm extension; remedy for swinging; ruling on knee raises, kicks, or kips; view taken on partial final pull-up.

Sit-ups. Positions of feet and hands; elbows on floor at start of each sit-up ?; knee bend; motion sequence; counting method; "buddy" system ?

Stop-watch(es). Error(s) found at briefing; correction(s) used.

Measuring tape(s). Error(s) found at briefing; correction(s) used.

Shuttle run. Length of run; blocks; motion sequence; "pacing" by another runner; starting procedure; who started ?; who timed ?; comparison of teacher's timings at briefing with other teachers' timings; two runs.

Standing broad jump. Take-off and landing surfaces; measuring techniques; footwear; three jumps.

Fifty-yard dash. Measurement and slope of track; wind; temperature; "pacing" by another runner; starting procedure; who started ?; who timed ?

Softball throw. Measurement and slope of range; wind; temperature; rear restraining line; "scratch" line; measurement technique; three throws; "buddy" system?

Six-hundred-yard run-walk. Dimensions of track; wind; temperature; single or multiple start and finish lines; number running at once; who started ?; who timed ?. "calling out" of times; "buddy" system ?

$N = 856$

PERCENTILES	CUM F	PERFORMANCE SCORES
0	0	61
5	42.8	105
10	85.6	115
15	128.4	123
20	171.2	130
25	214.0	133
30	256.8	137
35	299.6	141
40	342.4	146
45	385.2	150
50	428.0	154
55	470.8	159
60	513.6	162
65	556.4	167
70	599.2	172
75	642.0	175
80	684.8	180
85	727.6	186
90	770.4	194
95	813.2	201
100	856.0	273

CARD COUNTS FROM IBM COLUMN 36 → 30

CARD COUNTS (CUMULATIVE CARD COUNTS) FROM TOTALS OF FREQUENCIES IBM COLUMN 37 → 4 (8) 10 (18) 12 (30)

IBM COLUMN 38 → DISTANCES THROWN, IN FEET

000		010		020		030		040		050		060		070	1 (5)	080	1 (9)	090	
001		011		021		031		041		051		061	1	071	1 (6)	081		091	3 (21)
002		012		022		032		042		052		062		072		082	2 (11)	092	
003		013		023		033		043		053		063	1 (2)	073		083		093	
004		014		024		034		044		054		064	1 (3)	074		084	1 (12)	094	2 (23)
005		015		025		035		045		055		065		075		085	1 (13)	095	3 (26)
006		016		026		036		046		056		066	1 (4)	076	1 (7)	086	1 (14)	096	1 (27)
007		017		027		037		047		057		067		077	1 (8)	087	2 (16)	097	
008		018		028		038		048		058		068		078		088	1 (17)	098	1 (28)
009		019		029		039		049		059		069		079		089	1 (18)	099	2 (30)
100	4 (34)	110	7 (66)	120	12 (113)	130	14 (184)	140	9 (294)	150	17 (399)	160	13 (490)	170	11 (593)	180	22 (694)	190	7 (754)
101	1 (35)	111	7 (73)	121	5 (118)	131	16 (200)	141	9 (303)	151	11 (410)	161	11 (501)	171	6 (599)	181	5 (699)	191	5 (759)
102	2 (37)	112		122	3 (121)	132	9 (209)	142	7 (310)	152	4 (414)	162	16 (517)	172	9 (608)	182	11 (710)	192	5 (764)
103	4 (41)	113	3 (76)	123	9 (130)	133	13 (222)	143	9 (319)	153	8 (422)	163	9 (526)	173	11 (619)	183	5 (715)	193	6 (770)
104	1 (42)	114	8 (84)	124	4 (134)	134	8 (230)	144	8 (327)	154	7 (429)	164	7 (533)	174	10 (629)	184	6 (721)	194	5 (775)
105	5 (47)	115	2 (86)	125	8 (142)	135	15 (245)	145	8 (335)	155	6 (435)	165	15 (548)	175	16 (545)	185	2 (723)	195	8 (783)
106	1 (48)	116	7 (93)	126	9 (151)	136	7 (252)	146	12 (347)	156	10 (445)	166	3 (551)	176	5 (650)	186	10 (733)	196	4 (787)
107	3 (51)	117	2 (95)	127	7 (158)	137	8 (260)	147	16 (363)	157	11 (456)	167	7 (558)	177	7 (657)	187	2 (735)	197	6 (793)
108	3 (54)	118	4 (99)	128	4 (162)	138	13 (273)	148	13 (376)	158	9 (465)	168	14 (572)	178	9 (666)	188	7 (742)	198	6 (799)
109	5 (59)	119	2 (101)	129	8 (170)	139	12 (285)	149	6 (382)	159	12 (477)	169	10 (682)	179	5 (672)	189	5 (747)	199	5 (804)
	29 (59)		42 (101)		69 (170)		115 (285)		97 (382)		95 (477)		105 (582)		90 (672)		75 (747)		57 (804)

774 (804)

FREQUENCY MATRIX SHEET COMPLETED FOR SOFTBALL THROW FOR 15-YEAR-OLD BOYS

200	5 (809)	210	4 (832)	220	1 (845)	230		240	2 (853)	250		260	1 (855)	270		280		290	
201	6 (815)	211	1 (833)	221		231		241		251		261		271		281		291	
202	3 (818)	212	3 (836)	222	1 (846)	232	1 (851)	242		252		262		272		282		292	
203	1 (819)	213	2 (838)	223	1 (847)	233		243		253		263		273	1 (856)	283		293	
204	2 (821)	214	2 (840)	224		234		244		254		264		274		284		294	
205	1 (822)	215	1 (841)	225	2 (849)	235		245		255		265		275		285		295	
206	1 (823)	216		226		236		246		256		266		276		286		296	
207	2 (825)	217		227	1 (850)	237		247		257		267		277		287		297	
208		218	2 (843)	228		238		248		258		268		278		288		298	
209	3 (828)	219	1 (844)	229		239		249	1 (854)	259		269		279		289		299	
	24 (828)		16 (844)		6 (850)		1 (851)		3 (854)				1 (855)		1 (856)				52

IBM COLUMN 36 / 37 / 38

$N = 856$

NO-DATA REJECTS 173

CARD TOTAL 1029

APPENDIX B

THE YOUTH FITNESS TEST MANUAL OF THE AMERICAN ASSOCIATION FOR HEALTH, PHYSICAL EDUCATION AND RECREATION

A A

YOU

TES

AAHPER

YOUTH FITNESS TEST MANUAL

OPERATION FITNESS - U.S.A.

AAHPER hopes to develop a national awareness of fitness needs during the next five years. Many projects are being planned. The fitness of pre-school children, high school graduates, and college students will be a major concern. Health needs, recreational opportunities, more sports activities, hobbies, carry-over skills and activities, school and family camping, clinics, demonstrations, exhibits, sportsoramas, pageants, mass activity, outing activities, research in fitness and related areas, international relations, workshops and regional conferences, and many other aspects of fitness will be part of OPERATION FITNESS—U.S.A.

The AAHPER Fitness Test Program is one of the most important projects of OPERATION FITNESS—U.S.A. Other tests of sports skills and knowledge are soon to be developed.

The AAHPER National Fitness Test should be given periodically to all elementary school children starting at grade 5, and to all junior and senior high school youth. National norms, based on performances of 8500 boys and girls, grades 5-12, in 28 states, permit students to compare their fitness status with others of similar age and maturation level throughout the U.S.

For further information and for the catalog of test materials, certificates, and other motivation materials, write to AAHPER—NEA, Fitness Department, 1201 Sixteenth St., N.W., Washington 6, D. C.

A A H P E R

YOUTH FITNESS TEST MANUAL

AAHPER YOUTH FITNESS PROJECT
Paul A. Hunsicker, *Director*

Copyright 1958

Second printing 1959; Third printing 1960

AMERICAN ASSOCIATION FOR HEALTH,
PHYSICAL EDUCATION, AND RECREATION

A Department of the National Education Association
of the United States

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Washington 6, D. C.

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foreword

FEW EDUCATORS need to be convinced of the importance of fitness in our youth. For the past ten years, a deluge of newspaper and magazine articles have been decrying the lack of fitness in our youth. Television and radio programs have been devoted to various aspects of fitness.

This is not a modern lament. Every generation complains of the lack of fitness of the youth of its day. However, the present emphasis on fitness in peacetime is unusual.

The Kraus-Weber test results and other research findings pointed out the need for today's national concern about fitness. Youngsters were apparently spending too much time sitting and watching rather than taking part in vigorous activities. Verbal blasts were leveled at the schools and in particular at the physical education programs.

As a result, many fitness tests were devised, but none of them seemed to be an adequate measure of youth fitness in all its aspects. In an effort to shed light on the subject, the American Association for Health, Physical Education, and Recreation launched its Youth Fitness Project in 1957. This project marked the first attempt of our National Association to conduct a nation-wide survey of this nature—8500 boys and girls in grades 5 through 12. It should be looked upon as an initial study which gives some indication of what American youth can do in selected physical performance tests.

It is hoped that the information contained in this AAHPER Youth Fitness Test Manual will serve as a guide for teachers in administering the test items and using the results for planning programs to improve the fitness of youth. Community leaders and state association officers are encouraged to support the use of this testing project. A program recognizing fitness achievement will be developed. Physical education can make a unique educational contribution in this area of fitness.

The establishment of national norms for the AAHPER Youth Fitness Test was made possible only through the co-operation of the hundreds of interested persons throughout the country. On behalf of the Association, I wish to thank the superintendents, principals, supervisors, teachers, and students who helped in this project, which was ably directed by Dr. Paul A. Hunsicker.

Carl A. Troester Jr.

Carl A. Troester, Jr.
Executive Secretary, AAHPER

background

ALTHOUGH members of the American Association for Health, Physical Education, and Recreation have had an interest in fitness since the origin of their professional organization in 1885, efforts in the field of fitness have waxed and waned with the times. In general, there was peak interest during war years and the usual drop-off following the cessation of hostilities.

Although some of the current importance that is placed on fitness can no doubt be traced to the disquieting draftee rejection rate of the Korean War, there is an uncommonly large amount of concern about the fitness of the American people. The work of Kraus and his associates did much to revitalize interest in fitness.[1]

Largely as a result of the latter's findings, President Eisenhower called a conference on Fitness of American Youth in June 1956. This was followed by the creation of the President's Council on Youth Fitness on September 6, 1956. Within one week of this date, the American Association for Health, Physical Education, and Recreation held a Conference on Fitness in Washington. Approximately one hundred delegates attended the sessions. In an effort to implement one of the conference recommendations, a meeting of selected members of the Research Council was called in February 1957.

It was at this meeting in Chicago that the initial planning for the Youth Fitness Project took place. Those in attendance included Ruth Abernathy, Carolyn Bookwalter, Anna Espenschade, Esther French, Marjorie Phillips, Etta Walters, Karl Bookwalter, David Brace, Charles Cowell, Thomas Cureton, Arthur Esslinger, Paul Hunsicker, and Carl Troester. The participants were fully aware of the problems confronting any committee charged with the responsibility of surveying the fitness of the nation's youth. On the other hand, there was a general feeling that some concrete action should be taken. With this in mind, and with the thought that any project proposed would be looked upon as a pilot study,

---

[1] KRAUS, HANS and HIRSCHLAND, RUTH P. *Muscular Fitness and Health.* Washington, D. C.: AAPHER, 1953. 4 p. 15¢ (Reprint of article from *Journal of the American Association for Health–Physical Education–Recreation,* Dec. 1953.)

KRAUS, HANS and PRUDDEN, BONNIE. *Minimum Muscular Fitness in School Children.* Washington, D. C.: AAHPER, 1954. 12 p. 25¢ (Reprint of article from the *Research Quarterly,* 25, 2: 178-188; May 1954.)

the participants agreed on plans for a survey of the fitness of American youth.

At the end of the two days' deliberation, the tests described later in this manual were agreed upon, with the exception of the aquatic tests. The aquatic items originally suggested were modified after a discussion with Richard Brown of the American Red Cross. The Chicago meeting had overcome one major obstacle so frequently common in past meetings on testing; namely, the lack of agreement on a test battery. A test battery was agreed upon and the problem now became one of getting a nationwide sample of test results.

Shortly after the meeting in Chicago, Paul Hunsicker was named Director of the Project and an Advisory Committee, consisting of Anna Espenschade, Lynn McCraw, Marjorie Phillips, Jeannette Saurborn, Peter Sigerseth, and Carl Troester, was organized.

It soon became apparent that the selection of a representative sample of American youth would be one of the key problems in the study. It was decided to enlist the aid of professional survey research workers, so a contract was negotiated with the Survey Research Center of the University of Michigan. It was the Center's task to draw the sample schools, send out the initial contact letters asking for the school's co-operation, secure the enrollment figures, and decide which students in the school would be the subjects.

In August 1957, letters were sent to the schools selected asking them to return a form which listed enrollment figures for homerooms. In this way, we were sure of getting the total school population. When these data were returned to the Survey Research Center, the specific homerooms to be tested were drawn.

While waiting for the schools to return the information requested, numerous necessary details had to be worked out. Directions for administering the tests had to be mimeographed, data sheets were printed, letters were sent to people in various sections of the country asking them to assume the responsibility for supervising the test administration in their area, and a tentative itinerary was mapped out.

The routing was planned so that pupils in the northern states would be tested before the end of November, and students in the southern states by the end of February. Two factors upset the timetable—schools closed because of influenza epidemics and the severe winter throughout the south. It soon became obvious that the Project would not be completed in time for the AAHPER Convention in March. The thought of a delay was distasteful but there was no alternative. The deadline for completing the testing was moved to June 1958.

During the school year 1957-58, meetings were held throughout the United States with people who would be involved in the testing. Mimeographed test directions were distributed, the tests were demonstrated, and the sample was spelled out. Since it was desirable not to disrupt the school routine, the precise time of testing and other arrangements that had to be made with the schools were left to the discretion of the local people. Directions were given for recording and mailing the data to the University of Michigan.

As the data sheets arrived, two graduate assistants, Ronald Bos and Glen Thomet, transcribed the information to worksheets and arrangements were made for having the data punched onto IBM cards. The development of the percentile tables was done after the deadline date of June.

test administration

THE YOUTH FITNESS TEST battery consists of seven test items which are given in the gymnasium or outdoors and three aquatic tests. It is suggested that the pull-up (for boys), modified pull-up (for girls), sit-up, standing broad jump, and shuttle-run be given in one period; the 50-yard dash, softball throw for distance, and 600-yard run-walk in a second period. The aquatic tests could be worked into any existing swimming program.

The pupils should be given reasonable warm-up prior to the testing. A test should not be given to any pupil whose medical status is questionable.

1 pull-up

BOYS, GRADES 5-12

Equipment. A metal or wooden bar approximately 1½ inches in diameter is preferred. A doorway gym bar can be used and, if no regular equipment is available, a piece of pipe or even the rungs of a ladder can also serve the purpose *(Figure 1)*.

Description. The bar should be high enough so that the pupil can hang with his arms and legs fully extended and his feet free of the floor. Use the overhand grasp *(Figure 2)*. After assuming the hanging position, the pupil raises his body by his arms until his chin can be placed over the bar and then lowers his body to a full hang as in the starting position. The exercise is repeated as many times as possible.

Rules. 1. Allow one trial unless it is obvious that the pupil has not had a fair chance.

2. The body must not swing during the execution of the movement. The pull must in no way be a snap movement. If the pupil starts swinging, check this by holding your extended arm across the front of the thighs.

3. The knees must not be raised and kicking of the legs is not permitted.

Scoring. Record the number of completed pull-ups to the nearest whole number . . .

FIGURE 1
Improvised equipment for pull-up—Doorway gym bar in background, ladder in foreground.

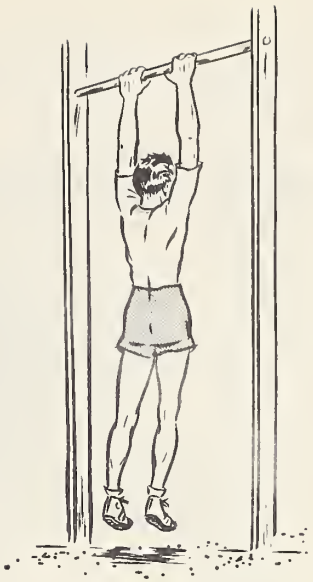


FIGURE 2
Starting position for pull-up.

modified pull-up

GIRLS, GRADES 5-12

Equipment. A metal or wooden bar approximately 1½ inches in diameter is preferred. A doorway gym bar can be used and, if no regular equipment is available, a piece of pipe can also serve the purpose. In some instances, it is possible to use the aisle between bleacher seats and have the bleachers support the pipe at the desired height *(Figure 3)*.

Description. Adjust the height of the bar so it is approximately at nipple level. Use an overhand grasp. The pupil extends her legs under the bar and extends the arms fully. The arms should form an angle of 90 degrees with the body line, and the body line should form an angle of 45 degrees with the floor *(Figure 4)*. The heels should be braced to prevent slipping; they can be resting on a mat or against an improvised rest, like the scorer's foot, to prevent slipping. From this position the pupil raises her body by her arms until the chest touches the bar, then lowers her body to a full hang. The exercise should be repeated.

Rules. 1. No resting is permitted.

2. No pull-up shall be counted in which the pupil fails to: keep the body straight, come to a full extension of the arms, or touch the chest to the bar.

3. The maximum number is 40.

Scoring. Record the number of completed pull-ups to the nearest whole number, with a maximum of 40.

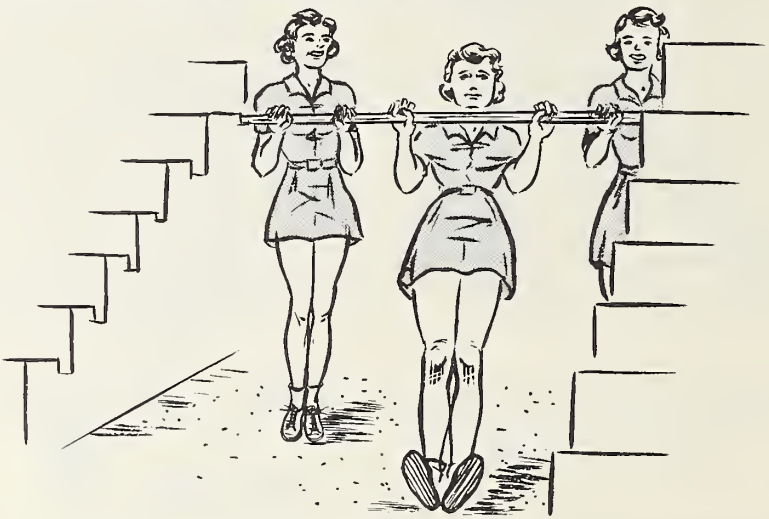


FIGURE 3

Improvised equipment for modified pull-up—bar supported on bleachers.

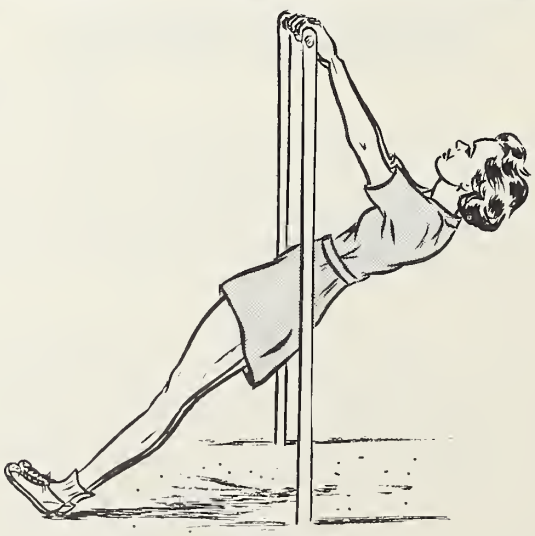


FIGURE 4

Starting position for modified pull-up. Note 90° angle from arms to body line, 45° angle from body line to floor.

2 sit-up

BOYS AND GIRLS, GRADES 5-12

Equipment. Mat or floor.

Description. The pupil lies on his back, either on the floor or on a mat, with legs extended and feet about two feet apart. His hands are placed on the back of the neck with the fingers interlaced. Elbows are retracted. A partner holds the ankles down, the heels being in contact with the mat or floor at all times *(Figure 5)*.

The pupil sits up, turning the trunk to the left and touching the right elbow to the left knee, returns to starting position, then sits up turning the trunk to the right and touching the left elbow to the right knee. The exercise is repeated, alternating sides *(Figure 6)*.

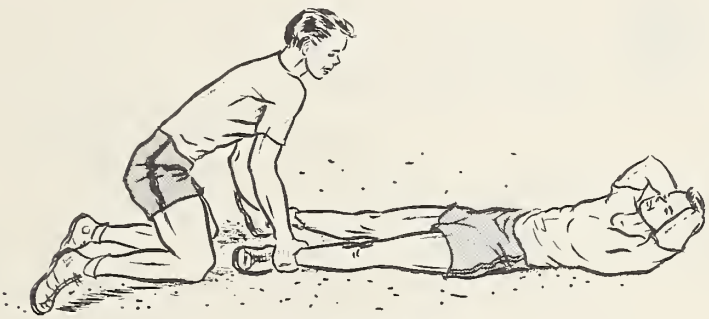


FIGURE 5
Starting position for sit-up.

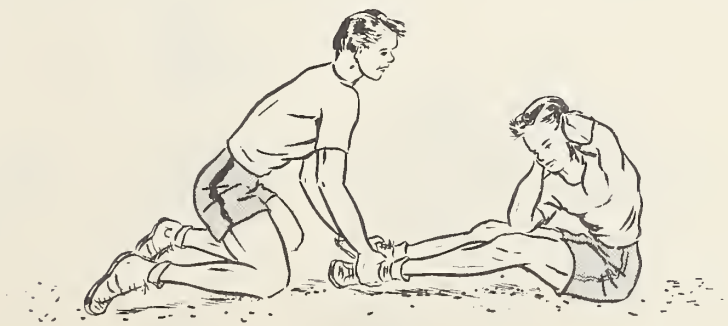


FIGURE 6
Sit-up.

Rules. 1. The fingers must remain in contact behind the neck throughout the exercise.

2. The knees must be on the floor during the sit-up but may be slightly bent when touching elbow to knee.

3. The back should be rounded and the head and elbows brought forward when sitting up as a "curl" up.

4. When returning to starting position, elbows must be flat on the mat before sitting up again.

Scoring. One point is given for each complete movement of touching elbow to knee. No score should be counted if the fingertips do not maintain contact behind the head, if knees are bent when the pupil lies on his back or when he begins to sit up, or if the pupil pushes up off the floor from an elbow. The maximum limit in terms of number of sit-ups shall be: 50 sit-ups for girls, 100 sit-ups for boys.

3 shuttle run

BOYS AND GIRLS, GRADES 5-12

Equipment. Two blocks of wood, 2 in. x 2 in. x 4 in., and stopwatch. Pupils should wear sneakers or run barefooted.

Description. Two parallel lines are marked on the floor 30 feet apart. The width of a regulation volleyball court serves as a suitable area. Place the blocks of wood behind one of the lines as indicated in *Figure 7*. The pupil starts from behind the other line. On the signal "Ready? Go!," the pupil runs to the blocks, picks one up, runs back to the starting line and *places* the block behind the line; he then runs back and picks up the second block which he carries back across the starting line. If the scorer has two stopwatches or one with a split-second timer, it is preferable

FIGURE 7
Starting the shuttle run.

to have two people running at the same time. To eliminate the necessity of returning the blocks after each race, start the races alternately, first from behind one line and then from behind the other.

Rules. Allow two trials with some rest between.

Scoring. Record the better of the two trials to the nearest tenth of a second.

4 standing broad jump

BOYS AND GIRLS, GRADES 5-12

Equipment. Mat, floor, or outdoor jumping pit, and tape measure.

Description. Pupil stands as indicated in *Figure 8*, with the feet several inches apart and the toes just behind the take-off line. Preparatory to jumping, the pupil swings the arms backward and bends the knees. The jump is accomplished by simultaneously extending the knees and swinging forward the arms.

1. Allow three trials.
2. Measure from the take-off line to the heel or other part of the body that touches the floor nearest the take-off line *(Figure 8)*.
3. When the test is given indoors, it is convenient to tape the tape measure to the floor at right angles to the take-off line and have the pupils jump along the tape. The scorer stands to the side and observes the mark to the nearest inch.

Scoring. Record the best of the three trials in feet and inches to the nearest inch.

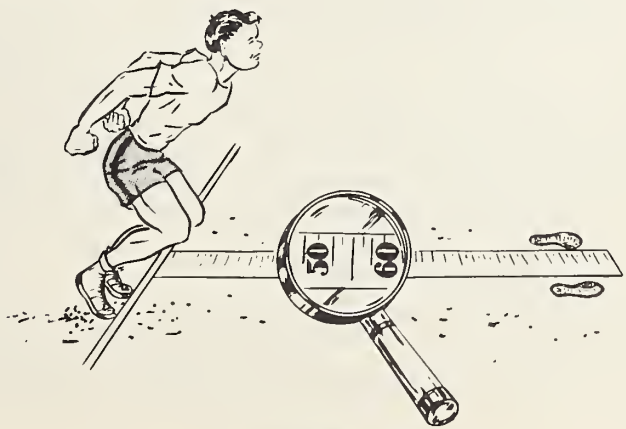


FIGURE 8
Measuring the standing broad jump.

5 50-yard dash

BOYS AND GIRLS, GRADES 5-12

Equipment. Two stopwatches or one with a split-second timer.

Description. It is preferable to administer this test to two pupils at a time. Have both take positions behind the starting line. The starter will use the commands "Are you ready?" and "Go!" The latter will be accompanied by a downward sweep of the starter's arm to give the timer a visual signal.

Rules. The score is the amount of time between the starter's signal and the instant the pupil crosses the finish line.

Scoring. Record in seconds to the nearest tenth of a second.

6 softball throw for distance

BOYS AND GIRLS, GRADES 5-12

Equipment. Softball (12-inch), small metal or wooden stakes, and tape measure.

Description. A football field marked in conventional fashion (five-yard intervals), makes an ideal area for this test. If this is not available, it is suggested that lines be drawn parallel to the restraining line, five yards apart. The pupil throws the ball while remaining within two parallel lines, six feet apart *(Figure 9)*. Mark the point of landing with one of the small stakes. If his second or third throw is farther, move the stake accordingly so that, after three throws, the stake is at the point of the pupil's best throw. It was found expedient to have the pupil jog out to his stake and stand there; and then, after five pupils have completed their throws, the measurements were taken. By having the pupil at his particular stake, there is little danger of recording the wrong score.

Rules. 1. Only an overhand throw may be used.

2. Three throws are allowed.

3. The distance recorded is the distance from the point of landing to the nearest point on the restraining line *(Figure 9)*.

Scoring. Record the best of the three trials to the nearest foot.

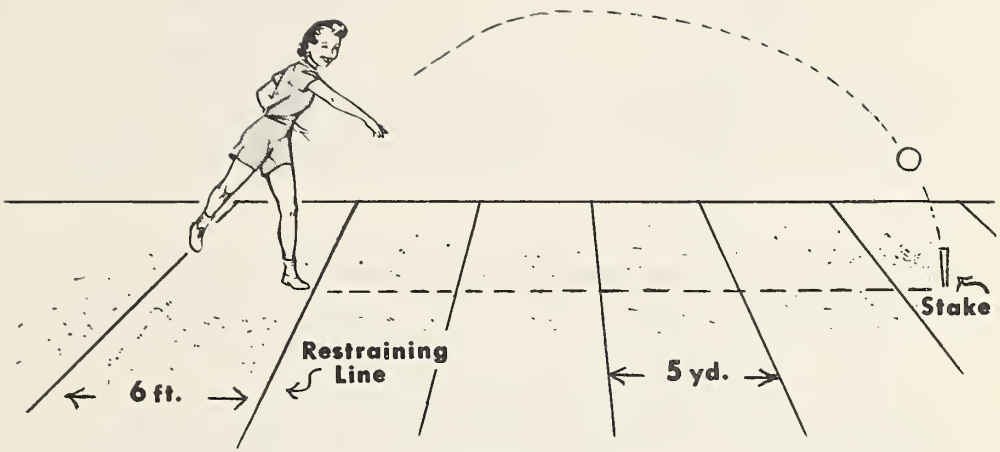


FIGURE 9

Measuring the softball throw for distance. Wherever ball lands, measure distance perpendicular to starting line.

7 600-yard run-walk

BOYS AND GIRLS, GRADES 5-12

Equipment. Track or area marked according to Figures 10-12, and stopwatch.

Description. Pupil uses a standing start. At the signal "Ready? Go!," the subject starts running the 600-yard distance. The running may be interspersed with walking. It is possible to have a dozen subjects run at one time by having the pupils pair off before the start of the event. Then each pupil listens for and remembers his partner's time as the latter crosses the finish. The timer merely calls out the times as the pupils cross the finish.

Rules. Walking is permitted, but the object is to cover the distance in the shortest possible time.

Scoring. Record in minutes and seconds.

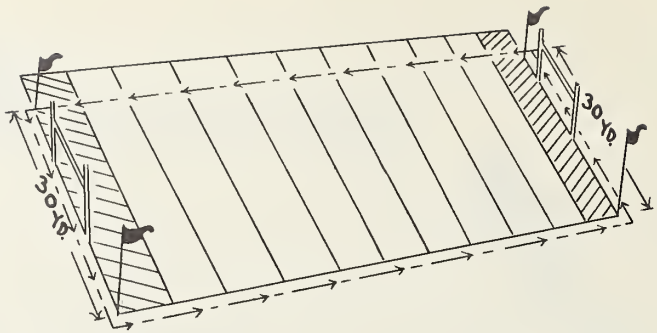


FIGURE 10
Using football field for 600-yard run-walk.

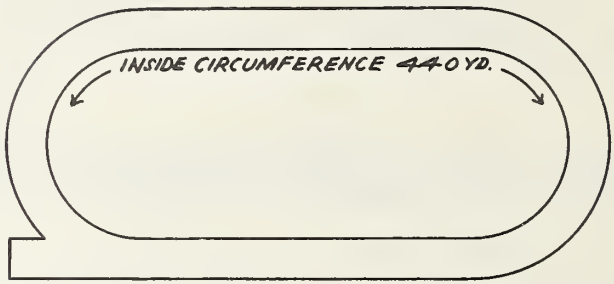


FIGURE 11
Using inside track for 600-yard run-walk.

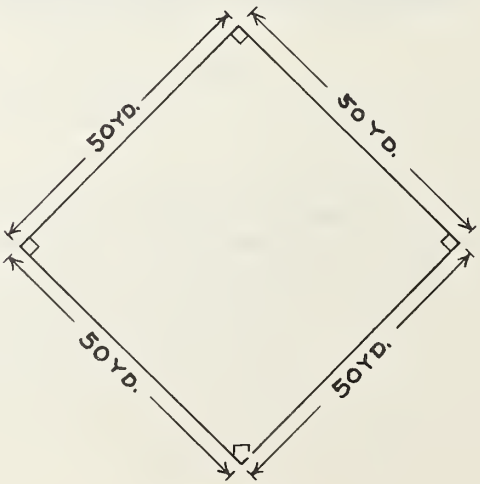


FIGURE 12
Using any open area for 600-yard run-walk.

aquatic tests

Equipment. Stopwatch.

Description.

Test 1: Swim 15 feet. Subject starts in the water and swims a distance of 15 feet, using a stroke or strokes of his own choice. Test is scored as "Pass" or "Fail."

Test 2: Subject jumps into water over his head. He is then required to swim 15 yards; turn around, swim back half the distance; turn on back and rest for one-half minute; turn onto front and swim to starting point. Test is scored as "Pass" or "Fail."

Test 3: Swim 100 yards against time. On the signal "Go!," subject dives into water and swims 100 yards. Time is kept from the signal "Go!" until subject completes the 100 yards. Record to the nearest second.

comparative data

BOTH teachers and pupils frequently want to know how a particular test score compares with those of other pupils of a similar age or maturation level. In addition, teachers should have some idea as to what the range of abilities are on selected physical performance tests.

The qualified physical educator will generally demand a more definitive classification than that offered by age alone. Others working with the test will want to use the simplified age classification. With this in mind, percentile tables based on age and tables based on the Neilson-Cozens Classification Index have been prepared.

In developing the tables based on age, anyone who was between 120 months and 131 months was considered a 10-year old; 132 to 143, an 11-year old; 144 to 155, a 12-year old; 156 to 167, a 13-year old, and so on, up to the age of 18. In other words, age was expressed in the number of birthdays the pupil had had. Tables 1-7 give the percentile figures for girls, and Tables 8-14, for boys. Bear in mind that there was a maximum limit for the Modified Pull-Ups for girls and the Sit-Ups for boys. In reading the tables, a girl who is 10 years old and does 26 Modified Pull-Ups is at the 55th Percentile (Table 1). This means that her performance is better than 55 percent of the 10-year-old girls, and that 45 percent of the 10-year-old girls exceed her performance.

To classify a pupil according to the Neilson-Cozens Classification Index, the following information must be secured:

1. Age to the nearest month.
2. Height in inches to the nearest half-inch (without shoes).
3. Weight to the nearest pound (gym clothes or no shoes, coats, or sweaters).

After having obtained age, height, and weight, consult Table 15 or Table 16 to determine the pupil's class (except for girls in grades 10, 11 and 12, who use column HSG in Tables 17-23). As an example, a boy in the seventh grade who is 146 months old, 60 inches tall, and weighs 98 pounds would be classified as (Table 15):

Data	*Exponent*
Age—146 months	5
Height—60 inches	10
Weight—98 pounds	8
Sum of exponents	23
Pupil's class	D

The percentile scores for this boy appear in Tables 24-30 under the column headed D.

Tables 17-23 are for girls, with columns A through H for grades 5 through 9, and column HSG for high school girls. Tables 24-30 are for boys through the 9th grade, and Tables 31-37 for boys in grades 10 through 12.

tables

TABLE 1. MODIFIED PULL-UPS FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	40	40	40	40	40	40	40	40	100th
95th	40	40	40	40	40	40	40	40	95th
90th	40	40	40	40	40	40	40	40	90th
85th	40	40	40	40	40	40	40	40	85th
80th	40	40	40	40	40	40	40	40	80th
75th	40	40	40	40	40	36	40	35	75th
70th	40	40	40	40	36	30	31	30	70th
65th	35	34	33	34	32	25	28	29	65th
60th	30	30	29	30	29	22	25	25	60th
55th	26	27	26	28	25	19	21	23	55th
50th	23	24	24	25	23	16	19	21	50th
45th	20	22	21	22	20	14	17	18	45th
40th	17	20	20	20	19	12	14	15	40th
35th	15	18	18	19	16	11	12	13	35th
30th	12	15	16	17	14	10	11	11	30th
25th	10	12	14	15	13	9	10	10	25th
20th	9	10	12	13	11	8	8	8	20th
15th	7	7	10	10	10	6	6	7	15th
10th	5	5	8	8	7	4	4	5	10th
5th	2	2	5	6	3	1	2	2	5th
0	0	0	0	0	0	0	0	0	0

TABLE 2. SIT-UPS FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	50	50	50	50	50	50	50	50	100th
95th	50	50	50	50	49	37	40	42	95th
90th	50	50	39	36	34	31	32	37	90th
85th	40	40	34	30	30	28	30	30	85th
80th	33	34	30	30	28	26	27	25	80th
75th	30	30	29	27	25	24	25	24	75th
70th	27	29	25	25	24	22	24	23	70th
65th	24	26	24	23	22	20	22	21	65th
60th	22	25	22	21	20	20	21	20	60th
55th	20	23	21	20	20	19	20	18	55th
50th	19	20	20	20	18	18	19	16	50th
45th	17	20	18	19	17	16	18	15	45th
40th	15	18	17	17	15	15	16	15	40th
35th	14	16	15	16	14	14	15	14	35th
30th	12	15	13	15	12	13	13	12	30th
25th	11	13	12	13	11	11	12	11	25th
20th	10	11	10	12	10	10	11	9	20th
15th	8	10	10	10	8	8	10	8	15th
10th	6	8	7	8	6	6	8	6	10th
5th	4	5	5	5	4	4	4	3	5th
0	0	0	0	0	0	0	0	0	0

TABLE 3. SHUTTLE RUN FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	10.0	9.8	9.0	9.0	9.2	9.1	9.0	8.9	100th
95th	11.2	10.9	10.4	10.7	10.5	10.5	10.3	10.4	95th
90th	11.5	11.2	10.8	11.0	10.8	10.8	10.5	10.4	90th
85th	11.7	11.5	11.0	11.2	11.0	11.0	10.8	10.6	85th
80th	11.8	11.6	11.3	11.3	11.2	11.0	11.0	10.8	80th
75th	12.0	11.9	11.5	11.5	11.4	11.2	11.0	11.0	75th
70th	12.1	12.0	11.7	11.6	11.5	11.4	11.2	11.2	70th
65th	12.2	12.0	11.9	11.8	11.6	11.5	11.4	11.3	65th
60th	12.4	12.2	12.0	12.0	11.8	11.8	11.5	11.5	60th
55th	12.6	12.4	12.2	12.0	12.0	12.0	11.5	11.6	55th
50th	12.8	12.5	12.3	12.1	12.0	12.0	11.7	11.8	50th
45th	13.0	12.7	12.5	12.2	12.2	12.1	12.0	12.0	45th
40th	13.1	12.9	12.6	12.4	12.5	12.3	12.0	12.1	40th
35th	13.3	13.0	12.9	12.6	12.5	12.5	12.1	12.3	35th
30th	13.5	13.2	13.0	12.8	12.8	12.8	12.3	12.4	30th
25th	13.6	13.5	13.4	13.0	13.0	13.0	12.5	12.6	25th
20th	14.0	13.7	13.6	13.3	13.1	13.1	12.7	13.0	20th
15th	14.1	14.0	14.1	13.5	13.5	13.4	13.1	13.4	15th
10th	14.7	14.4	14.5	14.0	13.7	14.0	13.5	13.8	10th
5th	15.0	15.0	15.0	14.8	14.0	14.4	14.0	14.2	5th
0	18.9	23.0	23.0	18.0	16.8	23.4	15.0	16.0	0

TABLE 4. STANDING BROAD JUMP FOR GIRLS

Percentile Scores Based on Age

Percentile	Age 10	11	12	13	14	15	16	17	Percentile
100th	6' 2"	7' 1"	6' 11"	6' 8"	6' 11"	7' 0"	7' 2"	7' 0"	100th
95th	5' 4"	5' 7"	5' 8"	5' 9"	6' 0"	6' 2"	6' 5"	6' 6"	95th
90th	5' 1"	5' 4"	5' 6"	5' 7"	5' 9"	6' 0"	6' 0"	6' 2"	90th
85th	4' 11"	5' 2"	5' 3"	5' 5"	5' 7"	5' 9"	5' 11"	6' 0"	85th
80th	4' 10"	5' 0"	5' 2"	5' 4"	5' 6"	5' 6"	5' 8"	5' 10"	80th
75th	4' 8"	4' 11"	5' 0"	5' 2"	5' 4"	5' 4"	5' 6"	5' 8"	75th
70th	4' 7"	4' 10"	4' 11"	5' 1"	5' 2"	5' 3"	5' 5"	5' 7"	70th
65th	4' 6"	4' 8"	4' 10"	5' 0"	5' 1"	5' 2"	5' 3"	5' 5"	65th
60th	4' 5"	4' 8"	4' 9"	4' 11"	5' 0"	5' 0"	5' 2"	5' 3"	60th
55th	4' 4"	4' 6"	4' 7"	4' 9"	4' 10"	5' 0"	5' 1"	5' 2"	55th
50th	4' 3"	4' 6"	4' 6"	4' 8"	4' 9"	4' 10"	5' 0"	5' 0"	50th
45th	4' 2"	4' 4"	4' 6"	4' 7"	4' 8"	4' 9"	4' 11"	5' 0"	45th
40th	4' 1"	4' 3"	4' 5"	4' 6"	4' 7"	4' 8"	4' 10"	4' 10"	40th
35th	4' 0"	4' 2"	4' 3"	4' 5"	4' 6"	4' 7"	4' 9"	4' 8"	35th
30th	3' 10"	4' 0"	4' 2"	4' 4"	4' 5"	4' 5"	4' 8"	4' 7"	30th
25th	3' 9"	3' 11"	4' 1"	4' 3"	4' 4"	4' 4"	4' 6"	4' 6"	25th
20th	3' 8"	3' 10"	4' 0"	4' 2"	4' 2"	4' 3"	4' 4"	4' 4"	20th
15th	3' 6"	3' 8"	3' 10"	3' 11"	4' 0"	4' 1"	4' 3"	4' 2"	15th
10th	3' 4"	3' 6"	3' 9"	3' 9"	3' 10"	4' 0"	4' 0"	4' 0"	10th
5th	3' 2"	3' 3"	3' 5"	3' 6"	3' 6"	3' 8"	3' 10"	3' 7"	5th
0	2' 5"	2' 5"	2' 9"	2' 7"	2' 3"	3' 0"	2' 6"	3' 1"	0

TABLE 5. 50-YARD DASH FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	6.9	6.8	6.2	6.0	6.2	6.7	6.0	6.0	100th
95th	8.0	7.5	7.2	7.4	7.3	7.4	7.1	7.3	95th
90th	8.2	8.0	7.5	7.6	7.5	7.7	7.4	7.6	90th
85th	8.4	8.0	7.9	7.8	7.8	7.8	7.5	7.8	85th
80th	8.5	8.2	8.0	7.9	8.0	8.0	7.7	8.0	80th
75th	8.6	8.3	8.1	8.0	8.0	8.0	7.9	8.1	75th
70th	8.7	8.4	8.2	8.1	8.1	8.1	8.0	8.2	70th
65th	8.8	8.5	8.3	8.2	8.2	8.2	8.1	8.3	65th
60th	8.9	8.6	8.4	8.2	8.3	8.3	8.2	8.4	60th
55th	9.0	8.7	8.6	8.4	8.4	8.5	8.3	8.5	55th
50th	9.1	8.9	8.7	8.5	8.5	8.6	8.4	8.6	50th
45th	9.3	9.0	8.9	8.6	8.6	8.8	8.5	8.8	45th
40th	9.5	9.0	9.0	8.8	8.8	8.9	8.6	8.9	40th
35th	9.5	9.1	9.1	8.9	8.8	9.0	8.7	9.0	35th
30th	9.6	9.2	9.2	9.0	9.0	9.1	8.9	9.2	30th
25th	9.8	9.4	9.3	9.0	9.1	9.2	9.0	9.5	25th
20th	10.0	9.5	9.5	9.2	9.3	9.5	9.3	10.0	20th
15th	10.1	9.7	9.7	9.5	9.5	9.8	9.7	10.5	15th
10th	10.4	10.0	10.0	9.8	10.0	10.1	10.0	10.8	10th
5th	10.8	10.5	10.4	10.5	10.5	10.8	10.9	11.1	5th
0	15.1	14.4	12.5	13.0	12.5	15.1	12.3	13.0	0

TABLE 6. SOFTBALL THROW FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	108	149	152	187	193	170	169	169	100th
95th	69	88	94	106	112	117	120	120	95th
90th	63	78	86	100	102	107	110	112	90th
85th	58	72	82	92	94	99	102	108	85th
80th	56	68	78	88	89	94	99	102	80th
75th	53	65	74	84	85	89	94	97	75th
70th	50	62	70	80	82	86	90	93	70th
65th	47	59	68	77	78	84	87	90	65th
60th	45	56	65	75	75	80	84	86	60th
55th	43	54	62	72	72	78	80	84	55th
50th	41	51	60	69	70	74	76	79	50th
45th	40	50	57	66	67	70	75	75	45th
40th	38	48	55	63	64	67	71	72	40th
35th	37	45	52	60	62	65	69	69	35th
30th	35	43	50	58	59	61	65	66	30th
25th	33	41	48	54	56	58	61	63	25th
20th	31	38	45	50	54	56	59	60	20th
15th	30	36	42	48	50	52	54	54	15th
10th	28	33	40	44	45	48	49	49	10th
5th	26	30	35	39	33	42	44	43	5th
0	13	16	21	19	18	10	28	30	0

TABLE 7. 600-YARD RUN-WALK FOR GIRLS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	2' 5"	2' 1"	2' 1"	2' 0"	1' 59"	1' 52"	2' 2"	2' 8"	100th
95th	2' 30"	2' 25"	2' 22"	2' 24"	2' 25"	2' 27"	2' 23"	2' 30"	95th
90th	2' 38"	2' 33"	2' 30"	2' 32"	2' 33"	2' 37"	2' 35"	2' 35"	90th
85th	2' 43"	2' 39"	2' 36"	2' 40"	2' 40"	2' 46"	2' 40"	2' 42"	85th
80th	2' 49"	2' 44"	2' 41"	2' 43"	2' 45"	3' 5"	2' 48"	2' 47"	80th
75th	2' 55"	2' 49"	2' 48"	2' 47"	2' 52"	2' 54"	2' 52"	2' 54"	75th
70th	2' 59"	2' 52"	2' 54"	2' 53"	2' 57"	3' 0"	3' 0"	3' 0"	70th
65th	3' 2"	2' 56"	2' 59"	2' 58"	3' 0"	3' 3"	3' 2"	3' 1"	65th
60th	3' 6"	3' 1"	3' 3"	3' 0"	3' 5"	3' 6"	3' 5"	3' 4"	60th
55th	3' 10"	3' 5"	3' 7"	3' 5"	3' 10"	3' 10"	3' 10"	3' 5"	55th
50th	3' 14"	3' 9"	3' 12"	3' 8"	3' 14"	3' 14"	3' 15"	3' 11"	50th
45th	3' 17"	3' 12"	3' 16"	3' 14"	3' 17"	3' 19"	3' 19"	3' 13"	45th
40th	3' 21"	3' 16"	3' 21"	3' 20"	3' 21"	3' 24"	3' 23"	3' 19"	40th
35th	3' 25"	3' 19"	3' 27"	3' 24"	3' 26"	3' 30"	3' 27"	3' 24"	35th
30th	3' 30"	3' 24"	3' 31"	3' 30"	3' 30"	3' 37"	3' 33"	3' 34"	30th
25th	3' 36"	3' 30"	3' 40"	3' 35"	3' 37"	3' 45"	3' 40"	3' 39"	25th
20th	3' 40"	3' 39"	3' 50"	3' 45"	3' 43"	3' 50"	3' 47"	3' 46"	20th
15th	3' 46"	3' 50"	3' 57"	3' 52"	3' 52"	3' 55"	3' 58"	3' 58"	15th
10th	3' 52"	3' 59"	4' 05"	4' 05"	4' 04"	4' 0"	4' 10"	4' 03"	10th
5th	4' 16"	4' 19"	4' 25"	4' 31"	4' 30"	4' 14"	4' 32"	4' 45"	5th
0	6' 9"	6' 20"	6' 23"	5' 50"	7' 50"	7' 0"	5' 50"	6' 0"	0

TABLE 8. PULL-UPS FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	12	11	20	14	15	20	18	16	100th
95th	6	6	7	8	10	10	13	12	95th
90th	5	5	6	7	8	9	11	11	90th
85th	4	4	5	6	7	8	10	10	85th
80th	3	4	4	5	6	7	9	10	80th
75th	2	3	4	4	5	6	8	9	75th
70th	2	2	3	4	5	5	7	8	70th
65th	2	2	3	4	4	5	7	7	65th
60th	1	2	2	3	4	5	6	7	60th
55th	1	1	2	3	3	4	6	6	55th
50th	1	1	2	2	3	4	5	6	50th
45th	1	1	1	2	2	4	5	5	45th
40th	0	1	1	2	2	3	4	5	40th
35th	0	0	1	1	2	3	4	4	35th
30th	0	0	1	1	1	2	3	4	30th
25th	0	0	0	1	1	2	3	3	25th
20th	0	0	0	0	1	1	3	3	20th
15th	0	0	0	0	0	1	2	3	15th
10th	0	0	0	0	0	1	2	2	10th
5th	0	0	0	0	0	0	1	1	5th
0	0	0	0	0	0	0	0	0	0

TABLE 9. SIT-UPS FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	99	99	99	99	99	99	99	99	100th
95th	99	99	99	99	99	99	99	99	95th
90th	60	67	78	73	99	99	99	99	90th
85th	50	52	60	60	70	73	83	73	85th
80th	47	50	51	54	60	60	73	63	80th
75th	41	42	50	50	53	54	62	60	75th
70th	39	38	44	48	50	50	55	55	70th
65th	35	35	40	44	50	50	51	51	65th
60th	30	31	37	40	44	45	50	50	60th
55th	28	30	33	37	41	41	48	48	55th
50th	26	26	31	35	39	40	44	44	50th
45th	24	25	30	33	36	37	41	40	45th
40th	22	23	28	30	33	35	40	38	40th
35th	20	21	25	30	31	32	36	35	35th
30th	18	20	23	26	30	30	34	32	30th
25th	16	17	20	25	26	29	32	30	25th
20th	14	15	19	22	24	25	30	28	20th
15th	12	12	16	20	21	23	26	25	15th
10th	10	10	12	17	19	20	22	24	10th
5th	6	6	10	12	15	15	18	20	5th
0	0	0	0	1	1	1	3	0	0

TABLE 10. SHUTTLE RUN FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	8.7	9.2	9.0	8.1	8.1	8.0	8.2	8.5	100th
95th	10.3	10.4	10.0	9.7	9.4	9.3	9.1	9.0	95th
90th	10.8	10.6	10.2	10.0	9.8	9.5	9.3	9.2	90th
85th	11.0	10.9	10.4	10.2	9.9	9.8	9.4	9.3	85th
80th	11.2	11.0	10.5	10.3	10.0	10.0	9.5	9.5	80th
75th	11.4	11.2	10.8	10.5	10.2	10.0	9.6	9.6	75th
70th	11.6	11.3	10.9	10.6	10.2	10.1	9.8	9.8	70th
65th	11.7	11.5	11.0	10.7	10.4	10.2	10.0	10.0	65th
60th	11.9	11.6	11.1	10.8	10.5	10.4	10.0	10.0	60th
55th	12.0	11.7	11.2	11.0	10.6	10.5	10.2	10.1	55th
50th	12.1	11.8	11.4	11.0	10.8	10.6	10.3	10.3	50th
45th	12.2	12.0	11.5	11.3	10.9	10.7	10.4	10.5	45th
40th	12.3	12.0	11.7	11.5	11.0	10.9	10.5	10.6	40th
35th	12.5	12.2	11.9	11.6	11.1	11.0	10.7	10.8	35th
30th	12.6	12.4	12.0	11.8	11.2	11.2	10.9	10.9	30th
25th	12.9	12.5	12.3	12.0	11.4	11.3	11.0	11.1	25th
20th	13.0	12.8	12.5	12.3	11.5	11.5	11.2	11.3	20th
15th	13.4	13.0	12.7	12.5	11.8	11.7	11.5	11.5	15th
10th	13.7	13.5	13.2	13.0	12.0	12.0	12.0	12.0	10th
5th	14.3	14.0	14.0	13.2	12.5	12.9	12.6	12.5	5th
0	16.0	16.1	16.5	18.0	15.2	15.0	17.5	17.6	0

TABLE 11. STANDING BROAD JUMP FOR BOYS

Percentile Scores Based on Age

Percentile	Age 10	11	12	13	14	15	16	17	Percentile
100th	7' 0"	7' 3"	7' 5"	7' 9"	8' 5"	8' 6"	9' 0"	9' 1"	100th
95th	5' 6"	5' 10"	6' 2"	6' 8"	7' 2"	7' 8"	8' 0"	8' 4"	95th
90th	5' 3"	5' 8"	6' 0"	6' 5"	7' 0"	7' 4"	7' 9"	8' 0"	90th
85th	5' 1"	5' 6"	5' 10"	6' 3"	6' 8"	7' 1"	7' 6"	7' 9"	85th
80th	5' 0"	5' 4"	5' 8"	6' 0"	6' 7"	7' 0"	7' 3"	7' 8"	80th
75th	4' 11"	5' 3"	5' 7"	5' 11"	6' 6"	6' 9"	7' 2"	7' 7"	75th
70th	4' 9"	5' 2"	5' 6"	5' 10"	6' 3"	6' 8"	7' 1"	7' 5"	70th
65th	4' 8"	5' 1"	5' 5"	5' 9"	6' 2"	6' 7"	7' 0"	7' 4"	65th
60th	4' 8"	5' 0"	5' 4"	5' 8"	6' 1"	6' 5"	6' 11"	7' 2"	60th
55th	4' 7"	4' 11"	5' 3"	5' 6"	5' 11"	6' 4"	6' 9"	7' 0"	55th
50th	4' 6"	4' 10"	5' 1"	5' 5"	5' 10"	6' 2"	6' 8"	6' 11"	50th
45th	4' 5"	4' 9"	5' 0"	5' 4"	5' 9"	6' 0"	6' 6"	6' 9"	45th
40th	4' 4"	4' 7"	4' 11"	5' 2"	5' 7"	5' 11"	6' 4"	6' 8"	40th
35th	4' 3"	4' 6"	4' 10"	5' 1"	5' 6"	5' 9"	6' 3"	6' 6"	35th
30th	4' 2"	4' 5"	4' 9"	4' 11"	5' 4"	5' 8"	6' 2"	6' 4"	30th
25th	4' 1"	4' 3"	4' 8"	4' 10"	5' 3"	5' 7"	6' 0"	6' 2"	25th
20th	4' 0"	4' 2"	4' 6"	4' 8"	5' 2"	5' 5"	5' 10"	6' 0"	20th
15th	3' 10"	4' 0"	4' 5"	4' 6"	5' 0"	5' 3"	5' 8"	5' 11"	15th
10th	3' 8"	3' 10"	4' 1"	4' 4"	4' 9"	5' 0"	5' 4"	5' 9"	10th
5th	3' 4"	3' 7"	3' 10"	4' 0"	4' 6"	4' 9"	5' 0"	5' 5"	5th
0	2' 2"	2' 4"	2' 2"	2' 10"	3' 4"	2' 10"	3' 9"	3' 8"	0

TABLE 12. 50-YARD DASH FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	6.5	6.1	6.0	5.8	5.6	5.5	5.4	5.4	100th
95th	7.6	7.3	7.0	6.5	6.5	6.2	6.1	6.0	95th
90th	7.9	7.5	7.2	6.9	6.8	6.4	6.2	6.1	90th
85th	8.0	7.7	7.4	7.0	6.9	6.5	6.3	6.2	85th
80th	8.1	7.9	7.5	7.2	7.0	6.7	6.4	6.3	80th
75th	8.3	8.0	7.6	7.3	7.1	6.8	6.5	6.4	75th
70th	8.4	8.1	7.8	7.4	7.2	6.9	6.6	6.5	70th
65th	8.5	8.2	7.9	7.5	7.3	7.0	6.7	6.6	65th
60th	8.6	8.3	8.0	7.6	7.3	7.0	6.8	6.6	60th
55th	8.7	8.4	8.0	7.7	7.4	7.1	6.9	6.7	55th
50th	8.8	8.5	8.0	7.8	7.5	7.1	7.0	6.8	50th
45th	9.0	8.6	8.2	7.9	7.6	7.2	7.0	6.9	45th
40th	9.0	8.7	8.3	8.0	7.7	7.3	7.0	7.0	40th
35th	9.2	8.8	8.4	8.0	7.8	7.4	7.1	7.0	35th
30th	9.3	8.9	8.5	8.2	7.9	7.5	7.2	7.1	30th
25th	9.4	9.0	8.6	8.3	8.0	7.6	7.3	7.2	25th
20th	9.6	9.1	8.8	8.5	8.1	7.8	7.4	7.3	20th
15th	9.7	9.4	9.0	8.6	8.2	8.0	7.6	7.5	15th
10th	10.0	9.7	9.2	9.0	8.5	8.0	7.8	7.6	10th
5th	10.8	10.2	9.6	9.3	8.8	8.5	8.0	7.9	5th
0	13.5	14.3	13.6	12.5	10.1	10.5	9.7	9.3	0

TABLE 13. SOFTBALL THROW FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	165	192	183	242	231	247	263	265	100th
95th	122	130	151	171	190	207	214	231	95th
90th	112	122	144	160	178	197	205	221	90th
85th	107	118	136	153	169	189	195	210	85th
80th	103	115	132	148	163	182	190	212	80th
75th	100	113	128	143	158	177	185	198	75th
70th	98	110	124	136	153	171	180	193	70th
65th	95	106	121	133	150	168	178	189	65th
60th	92	103	118	129	147	164	172	185	60th
55th	89	101	114	125	144	159	168	181	55th
50th	87	99	110	121	139	156	165	176	50th
45th	84	96	106	119	135	153	160	172	45th
40th	82	94	102	115	131	150	156	167	40th
35th	80	91	100	112	127	145	154	163	35th
30th	77	88	97	108	123	140	150	161	30th
25th	75	86	94	103	118	135	147	156	25th
20th	71	82	90	98	113	130	140	151	20th
15th	67	77	87	92	106	123	133	143	15th
10th	63	71	83	85	100	115	120	130	10th
5th	54	63	75	73	90	102	102	115	5th
0	31	20	36	36	47	50	48	64	0

TABLE 14. 600-YARD RUN-WALK FOR BOYS

Percentile Scores Based on Age

Percentile	Age								Percentile
	10	11	12	13	14	15	16	17	
100th	1' 45"	1' 39"	1' 45"	1' 40"	1' 30"	1' 23"	1' 30"	1' 25"	100th
95th	2' 15"	2' 2"	2' 5"	2' 0"	1' 50"	1' 43"	1' 40"	1' 36"	95th
90th	2' 23"	2' 15"	2' 12"	2' 5"	1' 56"	1' 50"	1' 45"	1' 44"	90th
85th	2' 27"	2' 21"	2' 16"	2' 10"	2' 2"	1' 55"	1' 48"	1' 48"	85th
80th	2' 30"	2' 24"	2' 19"	2' 13"	2' 5"	1' 59"	1' 51"	1' 51"	80th
75th	2' 34"	2' 27"	2' 22"	2' 15"	2' 8"	2' 1"	1' 54"	1' 54"	75th
70th	2' 38"	2' 31"	2' 26"	2' 18"	2' 11"	2' 5"	1' 56"	1' 55"	70th
65th	2' 41"	2' 34"	2' 29"	2' 21"	2' 13"	2' 7"	1' 59"	1' 58"	65th
60th	2' 45"	2' 37"	2' 32"	2' 25"	2' 18"	2' 9"	2' 0"	2' 0"	60th
55th	2' 48"	2' 40"	2' 35"	2' 27"	2' 20"	2' 10"	2' 3"	2' 2"	55th
50th	2' 51"	2' 43"	2' 39"	2' 29"	2' 22"	2' 14"	2' 5"	2' 4"	50th
45th	2' 55"	2' 47"	2' 42"	2' 32"	2' 25"	2' 17"	2' 7"	2' 6"	45th
40th	2' 58"	2' 50"	2' 46"	2' 36"	2' 30"	2' 20"	2' 10"	2' 9"	40th
35th	3' 3"	2' 56"	2' 50"	2' 40"	2' 34"	2' 24"	2' 12"	2' 14"	35th
30th	3' 6"	3' 1"	2' 56"	2' 44"	2' 37"	2' 28"	2' 16"	2' 17"	30th
25th	3' 10"	3' 7"	3' 2"	2' 50"	2' 44"	2' 31"	2' 23"	2' 22"	25th
20th	3' 15"	3' 12"	3' 6"	2' 57"	2' 52"	2' 25"	2' 30"	2' 26"	20th
15th	3' 23"	3' 20"	3' 17"	3' 2"	3' 0"	2' 42"	2' 36"	2' 35"	15th
10th	3' 36"	3' 29"	3' 33"	3' 15"	3' 14"	2' 55"	2' 41"	2' 44"	10th
5th	3' 48"	3' 48"	3' 50"	3' 39"	3' 33"	3' 16"	3' 2"	3' 5"	5th
0	5' 2"	5' 6"	7' 0"	5' 45"	5' 45"	5' 37"	5' 35"	5' 0"	0

TABLE 15. CLASSIFICATION INDEX FOR BOYS AND GIRLS
Grades 5, 6, 7, 8, 9

Exponent	*Age (Months)*	*Height (Inches)*	*Weight (Lb.)*	*Sum of Exponents*	*Class*
1	120-125	50-51	60-65	0-9	A
2	126-131	52-53	66-70	10-14	B
3	132-137		71-75	15-19	C
4	138-143	54-55	76-80	20-24	D
5	144-149		81-85	25-29	E
6	150-155	56-57	86-90	30-34	F
7	156-161		91-95	35-38	G
8	162-167	58-59	96-100	39-above	H
9	168-173		101-105		
10	174-179	60-61	106-110		
11	180-185		111-115		
12	186-191	62-63	116-120		
13	192-197		121-125		
14	198-203	64-65	126-130		
15	204-209	66-67	131-133		
16	210-215	68	134-136		
17	216-	69	137		

TABLE 16. CLASSIFICATION INDEX FOR BOYS*
Grades 10, 11, 12

Exponent	*Age (Months)*	*Height (Inches)*	*Weight (Lb.)*	*Sum of Exponents*	*Class*
9			53-59	88 and over	A
10			60-65	83-87	B
11			66-71	82 and below	C
12			72-78		
13			79-84		
14			85-90		
15			91-96		
16			97-103		
17			104-109		
18			110-115		
19			116-121		
20			122-128		
21			129-134		
22		0-47	135-140		
23		47.5-49	141-146		
24		49.5-51.5	147-153		
25		52-53.5	154-159		
26		54-55.5	160-165		
27	159-164	56-57.5	166-171		
28	165-170	58-59.5	172-178		
29	171-176	60-62	179-184		
30	177-182	62.5-64	185-190		
31	183-188	64.5-66	191-		
32	189-194	66.5-68			
33	195-200	68.5-70.5			
34	201-206	71-72.5			
35	207-212	73-74.5			
36	213-218	75-			
37	219-224				
38	225-230				

* For girls in grades 10, 11, and 12, see Tables 17-23, column HSG.

TABLE 17. MODIFIED PULL-UPS FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	40	40	40	40	40	40	40	40	40	100th
95th	40	40	40	40	40	40	40	40	40	95th
90th	40	40	40	40	40	40	40	40	40	90th
85th	40	40	40	40	40	40	40	40	40	85th
80th	40	40	40	40	40	40	40	35	40	80th
75th	40	40	40	40	40	40	35	31	35	75th
70th	40	40	40	40	40	40	31	27	30	70th
65th	38	35	36	35	35	35	28	24	26	65th
60th	30	32	31	30	31	31	25	22	23	60th
55th	28	29	29	25	28	27	22	20	20	55th
50th	26	25	25	23	25	25	20	18	17	50th
45th	21	24	21	21	22	22	19	17	15	45th
40th	19	22	19	20	20	20	17	16	13	40th
35th	17	20	17	17	19	18	14	14	11	35th
30th	15	17	15	15	17	16	13	14	10	30th
25th	13	13	13	13	14	14	11	12	9	25th
20th	10	11	10	10	12	12	10	10	8	20th
15th	9	9	8	8	10	10	7	9	6	15th
10th	7	6	5	6	8	7	6	5	4	10th
5th	4	3	2	3	5	5	3	1	1	5th
0	0	0	0	0	0	0	0	0	0	0

TABLE 18. SIT-UPS FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	50	50	50	50	50	50	50	50	50	100th
95th	50	50	50	50	50	50	40	40	42	95th
90th	50	50	50	41	40	37	30	31	32	90th
85th	45	40	40	35	33	31	28	30	30	85th
80th	36	35	33	30	30	29	26	26	27	80th
75th	30	31	30	29	27	26	24	24	25	75th
70th	26	30	30	26	25	25	22	22	23	70th
65th	24	27	27	24	22	23	21	20	22	65th
60th	22	25	25	22	21	21	20	20	20	60th
55th	20	23	23	21	20	20	18	19	20	55th
50th	20	21	20	20	19	19	16	19	18	50th
45th	18	20	20	19	17	17	15	17	16	45th
40th	16	17	18	18	16	16	14	16	15	40th
35th	15	15	16	16	14	15	13	15	14	35th
30th	13	13	15	15	13	14	12	13	13	30th
25th	11	12	13	13	11	12	10	12	12	25th
20th	10	11	11	11	10	10	9	10	11	20th
15th	8	10	10	10	8	9	8	9	9	15th
10th	6	7	7	8	6	6	6	5	7	10th
5th	5	5	4	6	4	4	4	3	4	5th
0	1	0	0	0	0	0	0	0	0	0

TABLE 19. SHUTTLE RUN FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	10.5	9.8	8.7	8.5	8.5	9.0	9.1	10.1	8.4	100th
95th	11.2	10.9	10.7	10.6	10.6	10.8	10.5	10.6	10.3	95th
90th	11.5	11.3	11.1	11.0	11.0	11.0	10.9	11.0	10.5	90th
85th	11.6	11.5	11.4	11.2	11.1	11.1	11.1	11.2	10.8	85th
80th	11.8	11.7	11.6	11.5	11.3	11.3	11.3	11.4	11.0	80th
75th	12.0	11.9	11.8	11.7	11.5	11.5	11.5	11.5	11.0	75th
70th	12.0	12.0	12.0	11.8	11.8	11.5	11.5	11.7	11.2	70th
65th	12.2	12.1	12.2	12.0	11.9	11.7	11.8	11.8	11.4	65th
60th	12.3	12.2	12.3	12.0	12.0	12.0	12.0	12.0	11.5	60th
55th	12.5	12.4	12.5	12.2	12.1	12.0	12.0	12.0	11.6	55th
50th	12.6	12.5	12.6	12.4	12.2	12.1	12.3	12.2	11.8	50th
45th	12.8	12.7	12.8	12.5	12.4	12.2	12.5	12.4	12.0	45th
40th	13.0	12.9	13.0	12.8	12.6	12.5	12.7	12.5	12.1	40th
35th	13.1	13.0	13.0	13.0	12.8	12.5	12.9	13.0	12.2	35th
30th	13.4	13.3	13.3	13.1	13.0	12.7	13.0	13.0	12.5	30th
25th	13.6	13.5	13.5	13.3	13.2	13.0	13.3	13.4	12.6	25th
20th	13.8	13.7	13.9	13.6	13.5	13.2	13.5	13.5	13.0	20th
15th	14.0	14.0	14.1	14.0	14.0	13.4	13.8	13.8	13.2	15th
10th	14.5	14.5	14.5	14.4	14.2	13.9	14.0	14.3	13.6	10th
5th	15.0	15.1	15.0	15.1	15.0	14.4	14.6	14.8	14.0	5th
0	18.2	18.0	18.9	23.0	23.0	15.4	18.0	23.4	16.9	0

TABLE 20. STANDING BROAD JUMP FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	6' 0"	6' 5"	7' 1"	7' 1"	6' 11"	6' 11"	6' 11"	6' 4"	7' 2"	100th
95th	5' 3"	5' 4"	5' 7"	5' 8"	5' 9"	5' 10"	6' 0"	5' 9"	6' 5"	95th
90th	5' 0"	5' 2"	5' 5"	5' 6"	5' 7"	5' 8"	5' 9"	5' 7"	6' 0"	90th
85th	4' 11"	5' 0"	5' 3"	5' 4"	5' 5"	5' 6"	5' 6"	5' 4"	5' 11"	85th
80th	4' 9	4' 10 "	5' 1"	5' 1"	5' 3"	5' 4"	5' 4"	5' 3"	5' 8"	80th
75th	4' 8"	4' 9"	5' 0"	5' 0"	5' 2"	5' 3"	5' 2"	5' 1"	5' 6"	75th
70th	4' 7"	4' 8"	4' 10"	4' 11"	5' 0"	5' 2"	5' 1"	5' 0"	5' 5"	70th
65th	4' 6"	4' 7"	4' 9"	4' 9"	4' 11"	5' 0"	5' 0"	4' 11"	5' 3"	65th
60th	4' 5"	4' 6"	4' 8"	4' 8"	4' 10"	5' 0"	4' 10"	4' 10"	5' 2"	60th
55th	4' 4"	4' 5"	4' 7"	4' 7"	4' 8"	4' 10"	4' 9"	4' 8"	5' 1"	55th
50th	4' 3"	4' 3"	4' 6"	4' 6"	4' 8"	4' 9"	4' 8"	4' 7"	5' 0"	50th
45th	4' 3"	4' 2"	4' 4"	4' 6"	4' 7"	4' 8"	4' 7"	4' 6"	4' 11"	45th
40th	4' 2"	4' 2"	4' 3"	4' 5"	4' 6"	4' 7"	4' 6"	4' 4"	4' 10"	40th
35th	4' 0"	4' 0"	4' 2"	4' 3"	4' 5"	4' 6"	4' 4"	4' 3"	4' 8"	35th
30th	3' 11"	4' 0"	4' 1"	4' 1"	4' 3"	4' 5"	4' 3"	4' 2"	4' 7"	30th
25th	3' 10"	3' 10"	4' 0"	4' 0"	4' 2"	4' 4"	4' 2"	4' 0"	4' 6"	25th
20th	3' 9"	3' 8"	3' 11"	3' 10"	4' 0"	4' 2"	4' 0"	3' 11"	4' 4"	20th
15th	3' 7"	3' 7"	3' 9"	3' 9"	3' 11"	4' 0"	4' 0"	3' 10"	4' 2"	15th
10th	3' 5"	3' 5"	3' 8"	3' 7"	3' 8"	3' 10"	3' 9"	3' 8"	4' 0"	10th
5th	3' 3"	3' 3"	3' 4"	3' 4"	3' 4"	3' 6"	3' 6"	3' 5"	3' 10"	5th
0	2' 10"	2' 10"	2' 9"	2' 5"	2' 5"	2' 10"	2' 3"	3' 0"	2' 8"	0

TABLE 21. 50-YARD DASH FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	7.4	6.9	6.0	6.4	6.0	6.4	6.2	6.7	5.8	100th
95th	8.0	7.9	7.5	7.4	7.3	7.3	7.4	7.5	7.3	95th
90th	8.2	8.1	8.0	7.7	7.5	7.5	7.6	7.9	7.5	90th
85th	8.4	8.2	8.0	7.9	7.7	7.8	7.8	8.0	7.7	85th
80th	8.5	8.4	8.1	8.0	7.9	8.0	8.0	8.1	7.9	80th
75th	8.6	8.5	8.2	8.1	8.0	8.0	8.0	8.2	8.0	75th
70th	8.7	8.6	8.3	8.3	8.1	8.0	8.1	8.3	8.1	70th
65th	8.8	8.7	8.4	8.4	8.2	8.1	8.3	8.4	8.2	65th
60th	8.9	8.8	8.5	8.5	8.3	8.2	8.4	8.5	8.3	60th
55th	9.0	9.0	8.6	8.6	8.5	8.3	8.6	8.6	8.4	55th
50th	9.0	9.0	8.8	8.7	8.6	8.4	8.7	8.8	8.5	50th
45th	9.1	9.2	8.9	8.9	8.8	8.5	8.8	8.9	8.6	45th
40th	9.3	9.3	9.0	9.0	8.9	8.6	9.0	9.0	8.8	40th
35th	9.5	9.4	9.1	9.0	9.0	8.8	9.0	9.0	8.9	35th
30th	9.5	9.5	9.2	9.2	9.1	9.0	9.2	9.2	9.0	30th
25th	9.7	9.6	9.3	9.4	9.2	9.0	9.4	9.4	9.2	25th
20th	9.9	9.8	9.5	9.6	9.5	9.1	9.5	9.5	9.5	20th
15th	10.0	10.0	9.7	9.8	9.7	9.2	9.8	9.7	10.0	15th
10th	10.2	10.2	10.0	10.0	10.0	9.4	10.0	10.0	10.5	10th
5th	10.9	10.7	10.5	10.4	10.4	9.7	10.5	10.5	11.0	5th
0	15.1	15.0	14.4	13.0	12.0	13.0	12.5	11.6	15.1	0

TABLE 22. SOFTBALL THROW FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	95	137	121	120	182	193	150	171	170	100th
95th	68	80	87	94	102	111	101	120	120	95th
90th	63	71	80	85	94	100	96	113	110	90th
85th	59	66	74	81	88	93	91	102	105	85th
80th	55	61	69	76	81	89	88	94	100	80th
75th	53	57	65	71	77	85	85	89	94	75th
70th	48	55	62	68	74	80	82	87	90	70th
65th	45	52	60	65	71	77	78	82	86	65th
60th	43	49	57	62	68	75	76	79	84	60th
55th	41	48	54	60	66	72	72	77	80	55th
50th	40	45	51	57	63	69	70	75	76	50th
45th	38	43	50	56	60	66	67	68	74	45th
40th	36	42	48	54	57	63	65	65	70	40th
35th	35	40	46	50	54	61	62	63	68	35th
30th	33	39	43	48	51	59	59	61	65	30th
25th	31	37	41	45	49	56	57	58	61	25th
20th	30	36	37	43	47	53	54	55	58	20th
15th	29	33	35	40	43	50	50	52	54	15th
10th	27	30	32	38	40	45	46	49	49	10th
5th	25	27	29	32	35	41	39	40	43	5th
0	21	13	15	20	18	19	10	18	27	0

TABLE 23. 600-YARD RUN-WALK FOR GIRLS

Percentile Scores Based on Classification Index

Percentile	Classification Index									Percentile
	A	B	C	D	E	F	G	H	HSG	
100th	2' 5"	2' 5"	2' 1"	2' 3"	2' 0"	2' 0"	2' 15"	2' 13"	1' 52"	100th
95th	2' 25"	2' 29"	2' 24"	2' 26"	2' 23"	2' 23"	2' 33"	2' 29"	2' 25"	95th
90th	2' 34"	2' 37"	2' 30"	2' 32"	2' 30"	2' 34"	2' 41"	2' 39"	2' 35"	90th
85th	2' 40"	2' 43"	2' 36"	2' 41"	2' 37"	2' 42"	2' 47"	2' 47"	2' 41"	85th
80th	2' 46"	2' 47"	2' 40"	2' 45"	2' 40"	2' 46"	2' 53"	2' 53"	2' 47"	80th
75th	2' 50"	2' 53"	2' 44"	2' 49"	2' 47"	2' 50"	2' 58"	2' 58"	2' 52"	75th
70th	2' 55"	2' 57"	2' 50"	2' 52"	2' 53"	2' 58"	3' 0"	3' 1"	2' 59"	70th
65th	2' 59"	3' 0"	2' 54"	2' 56"	2' 59"	3' 1"	3' 3"	3' 10"	3' 1"	65th
60th	3' 2"	3' 4"	3' 0"	3' 0"	3' 4"	3' 5"	3' 8"	3' 12"	3' 4"	60th
55th	3' 5"	3' 8"	3' 4"	3' 3"	3' 10"	3' 9"	3' 15"	3' 16"	3' 8"	55th
50th	3' 10"	3' 11"	3' 9"	3' 8"	3' 15"	3' 12"	3' 18"	3' 21"	3' 12"	50th
45th	3' 13"	3' 15"	3' 13"	3' 11"	3' 18"	3' 15"	3' 21"	3' 27"	3' 16"	45th
40th	3' 16"	3' 19"	3' 16"	3' 15"	3' 24"	3' 20"	3' 26"	3' 40"	3' 20"	40th
35th	3' 20"	3' 24"	3' 20"	3' 20"	3' 30"	3' 25"	3' 30"	3' 44"	3' 26"	35th
30th	3' 24"	3' 27"	3' 26"	3' 25"	3' 33"	3' 30"	3' 36"	3' 48"	3' 32"	30th
25th	3' 33"	3' 34"	3' 30"	3' 31"	3' 41"	3' 35"	3' 45"	3' 50"	3' 39"	25th
20th	3' 38"	3' 39"	3' 37"	3' 41"	3' 48"	3' 42"	3' 50"	3' 56"	3' 47"	20th
15th	3' 42"	3' 46"	3' 45"	3' 52"	3' 57"	3' 57"	4' 0"	4' 0"	3' 53"	15th
10th	3' 50"	3' 57"	3' 58"	4' 1"	4' 8"	4' 8"	4' 10"	4' 14"	4' 1"	10th
5th	4' 8"	4' 18"	4' 18"	4' 15"	4' 26"	4' 35"	4' 37"	4' 31"	4' 20"	5th
0	6' 9"	5' 42"	5' 18"	6' 20"	6' 23"	5' 50"	7' 50"	5' 54"	7' 0"	0

TABLE 24. PULL-UPS FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	12	13	13	11	20	20	14	19	100th
95th	7	7	6	7	7	10	9	10	95th
90th	5	5	5	5	6	8	7	8	90th
85th	5	5	4	4	5	7	6	7	85th
80th	4	4	4	4	4	6	5	6	80th
75th	4	2	3	3	4	5	5	6	75th
70th	3	2	3	3	3	4	4	5	70th
65th	3	2	2	2	3	4	4	5	65th
60th	3	2	2	2	2	3	4	4	60th
55th	2	2	2	2	2	3	3	4	55th
50th	2	1	1	1	2	2	3	3	50th
45th	2	1	1	1	1	2	3	3	45th
40th	1	1	1	1	1	2	2	2	40th
35th	1	1	1	0	1	1	2	2	35th
30th	1	0	0	0	1	1	1	1	30th
25th	0	0	0	0	0	1	1	1	25th
20th	0	0	0	0	0	0	1	1	20th
15th	0	0	0	0	0	0	0	0	15th
10th	0	0	0	0	0	0	0	0	10th
5th	0	0	0	0	0	0	0	0	5th
0	0	0	0	0	0	0	0	0	0

TABLE 25. SIT-UPS FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	99	99	99	99	99	99	99	99	100th
95th	99	99	99	96	99	99	99	99	95th
90th	73	72	71	65	70	91	77	99	90th
85th	60	53	56	53	58	66	60	73	85th
80th	50	50	50	50	50	55	55	60	80th
75th	47	42	48	45	50	50	51	55	75th
70th	41	40	40	40	44	50	50	51	70th
65th	40	35	38	37	40	45	47	50	65th
60th	33	31	34	34	38	40	43	45	60th
55th	30	30	30	32	35	39	40	42	55th
50th	28	26	29	30	32	36	38	40	50th
45th	25	24	26	28	30	34	35	36	45th
40th	23	22	25	25	30	30	32	34	40th
35th	21	21	23	23	28	30	30	32	35th
30th	20	20	20	21	26	26	27	30	30th
25th	18	17	18	20	23	24	25	27	25th
20th	16	14	15	17	20	22	24	25	20th
15th	14	12	14	14	17	20	20	23	15th
10th	11	10	11	12	12	17	18	19	10th
5th	7	7	7	9	9	11	12	15	5th
0	0	1	1	0	0	3	0	1	0

TABLE 26. SHUTTLE RUN FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	8.7	8.7	8.8	8.7	8.1	8.8	8.0	8.1	100th
95th	10.3	10.3	10.1	10.0	9.9	9.7	9.5	9.2	95th
90th	10.7	10.8	10.5	10.2	10.1	10.0	9.8	9.5	90th
85th	11.0	11.0	10.7	10.5	10.3	10.0	10.0	9.8	85th
80th	11.2	11.0	10.9	10.6	10.5	10.2	10.1	10.0	80th
75th	11.3	11.2	11.0	10.8	10.5	10.4	10.2	10.0	75th
70th	11.5	11.3	11.1	11.0	10.6	10.5	10.4	10.2	70th
65th	11.6	11.4	11.3	11.1	10.9	10.7	10.5	10.2	65th
60th	11.8	11.6	11.4	11.2	11.0	10.8	10.5	10.5	60th
55th	11.9	11.7	11.5	11.5	11.1	10.9	10.6	10.5	55th
50th	12.0	11.9	11.6	11.6	11.3	11.0	10.9	10.6	50th
45th	12.2	12.0	11.8	11.7	11.5	11.1	11.0	10.8	45th
40th	12.3	12.0	12.0	12.0	11.6	11.3	11.0	11.0	40th
35th	12.5	12.2	12.1	12.0	11.8	11.5	11.2	11.0	35th
30th	12.6	12.4	12.3	12.2	12.2	11.8	11.5	11.2	30th
25th	12.9	12.5	12.5	12.4	12.2	12.0	11.6	11.4	25th
20th	13.0	12.8	12.7	12.6	12.4	12.1	11.8	11.5	20th
15th	13.4	13.0	13.0	13.0	12.8	12.4	12.0	11.7	15th
10th	14.0	13.4	13.4	13.3	13.2	12.6	12.3	12.3	10th
5th	14.5	14.0	14.0	14.2	14.0	13.0	13.0	12.9	5th
0	16.0	15.9	16.0	16.0	18.0	16.5	14.8	16.8	0

TABLE 27. STANDING BROAD JUMP FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	6' 10"	7' 1"	7' 2"	7' 3"	7' 0"	7' 11"	8' 1"	8' 5"	100th
95th	5' 6"	5' 9"	5' 11"	6' 2"	6' 4"	6' 11"	7' 1"	7' 5"	95th
90th	5' 3"	5' 1"	5' 9"	5' 10"	6' 1"	6' 7"	6' 10"	7' 2"	90th
85th	5' 1"	5' 5"	5' 7"	5' 8"	6' 0"	6' 4"	6' 8"	7' 0"	85th
80th	5' 0"	5' 3"	5' 6"	5' 7"	5' 10"	6' 2"	6' 6"	6' 9"	80th
75th	4' 11"	5' 1"	5' 4"	5' 6"	5' 9"	6' 1"	6' 5"	6' 7"	75th
70th	4' 10"	5' 0"	5' 3"	5' 5"	5' 8"	5' 11"	6' 3"	6' 6"	70th
65th	4' 9"	4' 11"	5' 2"	5' 4"	5' 6"	5' 10"	6' 2"	6' 4"	65th
60th	4' 8"	4' 10"	5' 1"	5' 3"	5' 5"	5' 8"	6' 0"	6' 3"	60th
55th	4' 8"	4' 9"	5' 0"	5' 2"	5' 3"	5' 7"	5' 10"	6' 2"	55th
50th	4' 7"	4' 8"	4' 11"	5' 0"	5' 3"	5' 6"	5' 8"	6' 0"	50th
45th	4' 6"	4' 7"	4' 10"	4' 11"	5' 1"	5' 5"	5' 7"	5' 11"	45th
40th	4' 5"	4' 6"	4' 9"	4' 10"	5' 0"	5' 4"	5' 6"	5' 9"	40th
35th	4' 4"	4' 5"	4' 8"	4' 8"	4' 11"	5' 2"	5' 4"	5' 7"	35th
30th	4' 3"	4' 4"	4' 6"	4' 7"	4' 9"	5' 1"	5' 3"	5' 5"	30th
25th	4' 2"	4' 2"	4' 4"	4' 6"	4' 7"	5' 0"	5' 1"	5' 4"	25th
20th	4' 1"	4' 1"	4' 3"	4' 4"	4' 5"	4' 10"	4' 11"	5' 2"	20th
15th	4' 0"	4' 0"	4' 1"	4' 2"	4' 4"	4' 7"	4' 9"	5' 0"	15th
10th	3' 9"	3' 10"	3' 10"	4' 0"	4' 2"	4' 4"	4' 6"	4' 8"	10th
5th	3' 5"	3' 6"	3' 8"	3' 7"	3' 9"	3' 11"	4' 0"	4' 3"	5th
0	2' 7"	2' 3"	2' 2"	2' 11"	2' 4"	2' 11"	2' 2"	2' 10"	0

TABLE 28. 50-YARD DASH FOR ELEMENTARY AND JUNIOR HIGH SCHOOLS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	6.5	6.1	6.0	6.2	6.0	5.6	5.5	6.0	100th
95th	7.6	7.3	7.1	7.0	7.0	6.5	6.5	6.4	95th
90th	7.8	7.6	7.5	7.3	7.1	6.8	6.8	6.5	90th
85th	8.0	7.9	7.6	7.4	7.3	6.9	7.0	6.7	85th
80th	8.1	8.0	7.7	7.5	7.4	7.0	7.0	6.8	80th
75th	8.2	8.1	7.8	7.7	7.5	7.2	7.1	7.0	75th
70th	8.3	8.2	8.0	7.8	7.6	7.2	7.2	7.0	70th
65th	8.4	8.3	8.0	8.0	7.6	7.4	7.3	7.1	65th
60th	8.5	8.4	8.1	8.0	7.8	7.5	7.3	7.2	60th
55th	8.6	8.5	8.2	8.1	7.9	7.5	7.4	7.3	55th
50th	8.7	8.6	8.3	8.2	8.0	7.7	7.5	7.4	50th
45th	8.8	8.7	8.4	8.4	8.0	7.8	7.6	7.5	45th
40th	8.9	8.8	8.5	8.5	8.0	7.9	7.7	7.5	40th
35th	9.0	8.9	8.7	8.6	8.2	8.0	7.9	7.6	35th
30th	9.0	9.0	8.8	8.8	8.3	8.0	8.0	7.8	30th
25th	9.2	9.1	9.0	8.9	8.5	8.2	8.2	7.8	25th
20th	9.4	9.3	9.0	9.0	8.6	8.4	8.3	8.0	20th
15th	9.6	9.5	9.2	9.1	8.9	8.6	8.5	8.0	15th
10th	9.8	9.8	9.5	9.5	9.1	9.0	8.9	8.4	10th
5th	10.5	10.3	10.0	9.9	9.5	9.5	9.3	8.8	5th
0	14.3	13.0	13.5	13.7	13.6	13.2	11.1	12.5	0

TABLE 29. SOFTBALL THROW FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	152	153	165	179	190	231	231	247	100th
95th	114	125	132	149	160	174	185	204	95th
90th	108	117	125	143	150	162	171	192	90th
85th	102	112	121	134	144	155	162	185	85th
80th	100	107	118	128	140	151	157	177	80th
75th	96	104	115	124	134	148	152	171	75th
70th	94	102	112	120	129	144	148	166	70th
65th	90	100	109	118	127	140	144	163	65th
60th	87	98	105	114	124	135	140	159	60th
55th	86	96	102	112	120	131	137	156	55th
50th	84	94	100	110	118	126	135	152	50th
45th	82	91	98	106	115	123	132	150	45th
40th	80	89	96	103	111	118	128	148	40th
35th	77	86	93	100	109	114	125	144	35th
30th	75	84	90	96	103	110	121	140	30th
25th	72	81	87	92	98	105	117	135	25th
20th	70	77	84	89	94	101	112	130	20th
15th	66	74	80	85	90	96	106	125	15th
10th	60	68	75	78	84	86	98	118	10th
5th	55	60	65	70	74	80	90	99	5th
0	28	23	36	36	20	41	50	34	0

TABLE 30. 600-YARD RUN-WALK FOR ELEMENTARY AND JUNIOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index								Percentile
	A	B	C	D	E	F	G	H	
100th	1' 46"	1' 42"	1' 45"	1' 39"	1' 31"	1' 44"	1' 35"	1' 23"	100th
95th	2' 15"	2' 7"	2' 8"	2' 4"	2' 2"	1' 57"	1' 54"	1' 44"	95th
90th	2' 20"	2' 15"	2' 16"	2' 11"	2' 6"	2' 2"	1' 59"	1' 52"	90th
85th	2' 25"	2' 21"	2' 21"	2' 15"	2' 12"	2' 5"	2' 3"	1' 58"	85th
80th	2' 27"	2' 25"	2' 25"	2' 19"	2' 16"	2' 8"	2' 6"	2' 2"	80th
75th	2' 30"	2' 29"	2' 28"	2' 22"	2' 19"	2' 11"	2' 8"	2' 5"	75th
70th	2' 33"	2' 31"	2' 30"	2' 26"	2' 22"	2' 15"	2' 11"	2' 9"	70th
65th	2' 36"	2' 35"	2' 33"	2' 28"	2' 25"	2' 17"	2' 15"	2' 11"	65th
60th	2' 38"	2' 38"	2' 38"	2' 32"	2' 29"	2' 20"	2' 19"	2' 14"	60th
55th	2' 42"	2' 41"	2' 41"	2' 35"	2' 32"	2' 23"	2' 22"	2' 17"	55th
50th	2' 45"	2' 44"	2' 44"	2' 38"	2' 37"	2' 26"	2' 26"	2' 20"	50th
45th	2' 48"	2' 49"	2' 47"	2' 43"	2' 41"	2' 30"	2' 28"	2' 23"	45th
40th	2' 50"	2' 50"	2' 50"	2' 49"	2' 45"	2' 33"	2' 31"	2' 27"	40th
35th	2' 55"	2' 55"	2' 55"	2' 52"	2' 52"	2' 38"	2' 34"	2' 31"	35th
30th	2' 59"	2' 59"	3' 1"	2' 58"	2' 59"	2' 44"	2' 40"	2' 35"	30th
25th	3' 3"	3' 4"	3' 5"	3' 5"	3' 3"	2' 51"	2' 45"	2' 40"	25th
20th	3' 8"	3' 10"	3' 11"	3' 15"	3' 13"	3' 0"	2' 52"	2' 52"	20th
15th	3' 10"	3' 15"	3' 20"	3' 23"	3' 20"	3' 7"	3' 1"	3' 0"	15th
10th	3' 27"	3' 24"	3' 30"	3' 36"	3' 36"	3' 20"	3' 17"	3' 17"	10th
5th	3' 41"	3' 42"	3' 51"	3' 49"	3' 57"	3' 54"	3' 40"	3' 30"	5th
0	4' 58"	4' 50"	5' 45"	4' 43"	7' 0"	5' 45"	5' 0"	5' 0"	0

TABLE 31. PULL-UPS FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	14	18	20	100th
95th	12	12	11	95th
90th	10	11	10	90th
85th	10	10	9	85th
80th	8	9	8	80th
75th	7	8	7	75th
70th	7	7	7	70th
65th	6	7	6	65th
60th	6	6	6	60th
55th	5	6	5	55th
50th	5	6	5	50th
45th	5	5	4	45th
40th	5	5	4	40th
35th	4	4	4	35th
30th	4	4	3	30th
25th	3	3	3	25th
20th	3	3	2	20th
15th	2	2	2	15th
10th	1	2	1	10th
5th	0	1	0	5th
0	0	0	0	0

TABLE 32. SIT-UPS FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	99	99	99	100th
95th	99	99	99	95th
90th	70	99	99	90th
85th	63	90	75	85th
80th	60	74	64	80th
75th	50	63	60	75th
70th	48	56	55	70th
65th	43	51	51	65th
60th	40	50	50	60th
55th	40	49	45	55th
50th	37	45	42	50th
45th	35	40	40	45th
40th	34	38	38	40th
35th	31	35	35	35th
30th	30	33	32	30th
25th	25	30	30	25th
20th	22	29	29	20th
15th	20	27	25	15th
10th	19	22	23	10th
5th	15	16	19	5th
0	9	7	0	0

TABLE 33. SHUTTLE RUN FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	8.8	8.2	8.5	100th
95th	9.3	9.2	9.0	95th
90th	9.6	9.3	9.2	90th
85th	9.8	9.5	9.4	85th
80th	10.0	9.6	9.5	80th
75th	10.2	9.8	9.7	75th
70th	10.2	9.8	9.8	70th
65th	10.3	9.9	10.0	65th
60th	10.4	10.0	10.0	60th
55th	10.4	10.2	10.2	55th
50th	10.5	10.3	10.3	50th
45th	10.7	10.5	10.4	45th
40th	10.8	10.6	10.5	40th
35th	11.0	10.8	10.7	35th
30th	11.1	11.0	10.9	30th
25th	11.2	11.1	11.0	25th
20th	11.3	11.4	11.2	20th
15th	11.4	11.6	11.5	15th
10th	11.8	11.9	12.0	10th
5th	12.5	12.3	12.6	5th
0	14.1	14.2	17.6	0

TABLE 34. STANDING BROAD JUMP FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	8' 6"	8' 11"	9' 1"	100th
95th	7' 7"	7' 11"	8' 3"	95th
90th	7' 6"	7' 8"	8' 0"	90th
85th	7' 2"	7' 5"	7' 9"	85th
80th	7' 0"	7' 3"	7' 7"	80th
75th	6' 10"	7' 2"	7' 5"	75th
70th	6' 9"	7' 0"	7' 3"	70th
65th	6' 7"	6' 11"	7' 2"	65th
60th	6' 6"	6' 10"	7' 0"	60th
55th	6' 4"	6' 8"	6' 11"	55th
50th	6' 4"	6' 7"	6' 9"	50th
45th	6' 2"	6' 6"	6' 8"	45th
40th	5' 11"	6' 4"	6' 7"	40th
35th	5' 10"	6' 3"	6' 5"	35th
30th	5' 9"	6' 2"	6' 3"	30th
25th	5' 8"	6' 0"	6' 1"	25th
20th	5' 8"	5' 10"	6' 0"	20th
15th	5' 7"	5' 8"	5' 10"	15th
10th	5' 5"	5' 6"	5' 6"	10th
5th	5' 2"	5' 0"	5' 3"	5th
0	4' 1"	4' 4"	3' 8"	0

TABLE 35. 50-YARD DASH FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	5.8	5.4	5.4	100th
95th	6.1	6.1	6.0	95th
90th	6.3	6.2	6.1	90th
85th	6.4	6.4	6.2	85th
80th	6.5	6.5	6.3	80th
75th	6.6	6.5	6.4	75th
70th	6.7	6.6	6.5	70th
65th	6.9	6.7	6.6	65th
60th	7.0	6.8	6.7	60th
55th	7.0	6.9	6.8	55th
50th	7.0	7.0	6.8	50th
45th	7.1	7.0	7.0	45th
40th	7.1	7.0	7.0	40th
35th	7.3	7.1	7.0	35th
30th	7.3	7.2	7.1	30th
25th	7.5	7.2	7.2	25th
20th	7.6	7.3	7.4	20th
15th	7.6	7.5	7.5	15th
10th	8.0	7.6	7.7	10th
5th	8.2	8.0	8.0	5th
0	9.8	8.8	10.5	0

TABLE 36. SOFTBALL THROW FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	203	221	265	100th
95th	195	201	225	95th
90th	185	193	216	90th
85th	182	188	210	85th
80th	177	182	204	80th
75th	172	179	198	75th
70th	167	174	192	70th
65th	166	171	188	65th
60th	161	167	185	60th
55th	157	163	180	55th
50th	156	160	177	50th
45th	153	157	172	45th
40th	152	154	168	40th
35th	147	151	165	35th
30th	144	149	161	30th
25th	138	145	154	25th
20th	132	139	150	20th
15th	127	134	142	15th
10th	115	118	130	10th
5th	96	101	115	5th
0	48	50	64	0

TABLE 37. 600-YARD RUN-WALK FOR HIGH SCHOOL BOYS

Percentile Scores Based on Classification Index

Percentile	Classification Index			Percentile
	C	B	A	
100th	1' 35"	1' 35"	1' 23"	100th
95th	1' 43"	1' 43"	1' 37"	95th
90th	1' 52"	1' 46"	1' 45"	90th
85th	1' 55"	1' 49"	1' 48"	85th
80th	2' 0"	1' 54"	1' 51"	80th
75th	2' 0"	1' 57"	1' 54"	75th
70th	2' 3"	1' 59"	1' 56"	70th
65th	2' 7"	2' 0"	1' 58"	65th
60th	2' 8"	2' 3"	2' 0"	60th
55th	2' 10"	2' 6"	2' 2"	55th
50th	2' 12"	2' 8"	2' 4"	50th
45th	2' 13"	2' 10"	2' 6"	45th
40th	2' 14"	2' 12"	2' 9"	40th
35th	2' 15"	2' 16"	2' 13"	35th
30th	2' 17"	2' 21"	2' 18"	30th
25th	2' 23"	2' 26"	2' 24"	25th
20th	2' 28"	2' 30"	2' 30"	20th
15th	2' 32"	2' 37"	2' 36"	15th
10th	2' 39"	2' 47"	2' 45"	10th
5th	2' 52"	3' 10"	3' 2"	5th
0	4' 8"	5' 0"	4' 21"	0

PERSONAL

FITNESS RECORD

Name.....Grade.....

School.....

AAHPER YOUTH FITNESS TEST

American Association for Health, Physical Education, and Recreation

A Department of the National Education Association

1201 - 16th Street, N. W.
Washington 6, D. C.

PERSONAL DATA

	Trial 1		Trial 2	
		*Exponent**		*Exponent**
Age (in months)	_____	_____	_____	_____
Height (in inches)	_____	_____	_____	_____
Weight	_____	_____	_____	_____
Sum of Exponents*	_____	_____	_____	_____
Class*	_____	_____	_____	_____

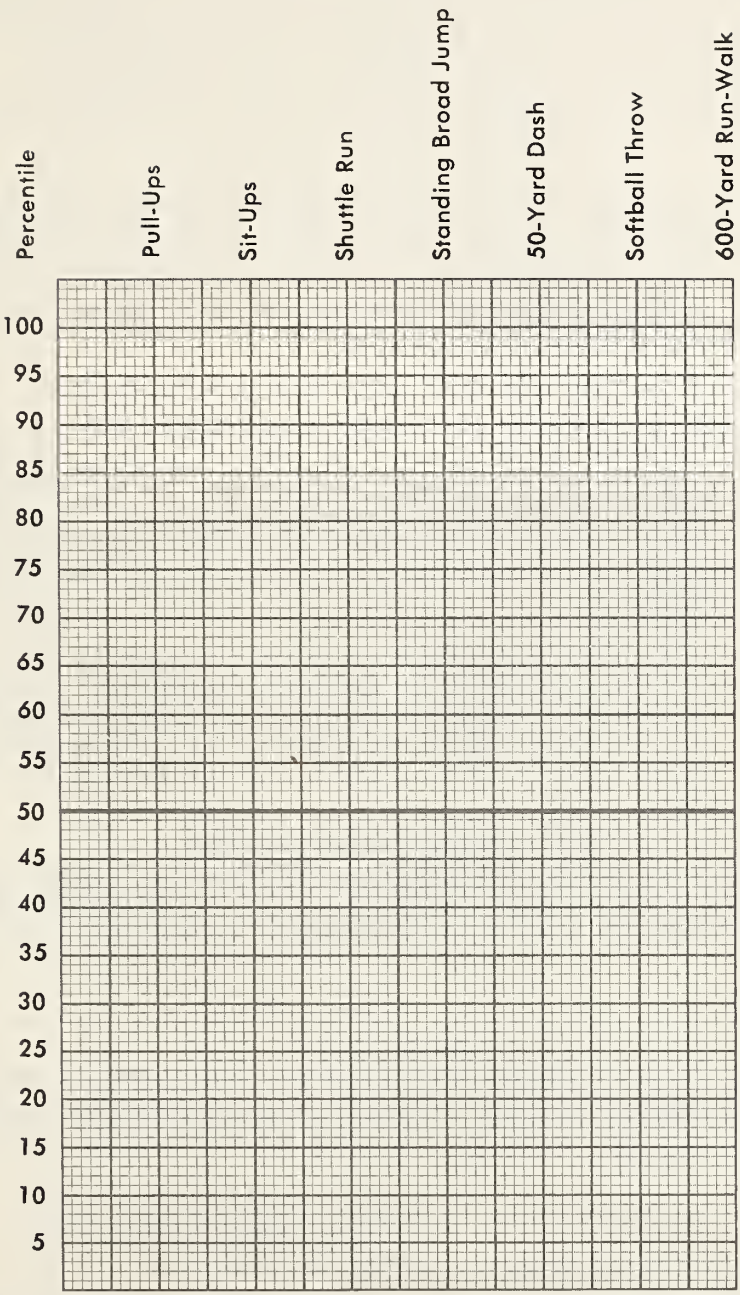
NOTE: For girls in grades 10, 11, and 12, see Tables 17-23, column HSG.

	Trial 1		Trial 2	
	Date *Score*	*Percentile**	Date *Score*	*Percentile**
Pull-Ups (Boys)	_____	_____	_____	_____
Modified Pull-Ups (Girls)	_____	_____	_____	_____
Sit-Ups	_____	_____	_____	_____
Shuttle Run	_____	_____	_____	_____
Standing Broad Jump	_____	_____	_____	_____
50-Yard Dash	_____	_____	_____	_____
Softball Throw	_____	_____	_____	_____
600-Yard Run-Walk	_____	_____	_____	_____

Swimming Tests	Trial 1		Trial 2	
	Poss	*Fail*	*Pass*	*Fail*
Test 1†	_____	_____	_____	_____
Test 2†	_____	_____	_____	_____
	Time (in seconds)		*Time (in seconds)*	
Test 3†	_____		_____	

* See tables in *AAHPER Youth Fitness Test Manual.*
† See p.13, *AAHPER Youth Fitness Test Manual.*

PROFILE RECORD



Plot your personal graph using the information on opposite page. Use a different color for each trial.

HOW TO RECORD YOUR SCORE

This is your individual fitness record, prepared so you may know your own performance and work to improve your score. Keep these records each year, so that you can see your progress. You can also compare your score with the scores of other students in your own school and in schools throughout the United States.

1. There are places to record your scores on two trials. Take the two tests at least 3 to 4 months apart.

2. Record your age to the nearest month, your height in inches, and your weight in pounds. Use Table 15 or Table 16 in the *AAHPER Youth Fitness Test Manual* to find the *exponents* and your *class* (A, B, C, D, E, F, G, or H), except for girls in grades 10, 11, and 12, who use the column headed HSG in Tables 17-23.

3. As you take each test, record your score in the space provided. Use the appropriate classification tables in the *AAHPER Youth Fitness Test Manual* to find your *percentile score*. Enter this percentile score. Your percentile score tells you where you stand in relation to other students. For instance, if your score was the 60th percentile, you scored higher than 60 percent of the students in your classification.

4. Plot a chart of your fitness on the graph by placing a dot on each line at the percentile you scored on each test. Connect the dots with straight lines. The heavy black line at the 50th percentile shows the average. Use different color pencils to plot your two scores. Indicate the date of each trial.

TO IMPROVE YOUR FITNESS

If you want to improve your score, you should ask your physical education teacher to help you plan a program of activities in connection with your physical education classes and outside of school.

SAMPLE FORMS

The Personal Fitness Record and the Class Composite Record are included in the manual as samples only. Quantity orders may be addressed to: AAHPER, 1201 Sixteenth Street, N.W., Washington 6, D. C.

Personal Fitness Record . . . 5¢ each; 100-499: 3¢ each; 500-999: 2¾¢ each; 1000-up: 2½¢ each.

Class Composite Record . . . 3¢ each. Minimum-25: 75¢

AAHPER YOUTH FITNESS PROJECT

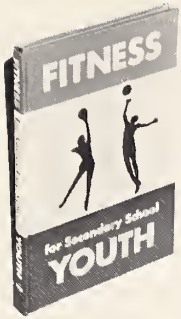
DATA SHEET

(Class Composite Record)

Name of School: _____ Location: _____ Date _____

Name of Student	Grade	Date of Birth	Height	Weight	Classif. Index	Sit-Ups	Pull-Ups	Mod. Pull-Ups	Shuttle Run	Stand. Broad Jump	50-Yard	Softball Throws	600-Yard	15-Foot Swim	Swim, Turn, Float-Swim	100 Yard Swim			

Notes



AAHPER
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Up-to-date research and program outlines for total fitness for the teen-age population. 1956.
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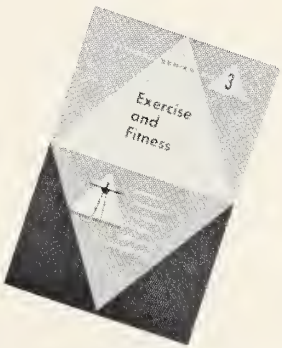

FIT TO TEACH
Yearbook concerned with the health of the teacher; outlines personal, administrative, organizational, and community responsibilities for its maintenance and promotion. Third AAHPER yearbook. 1957.
260 p.....$3.50

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